

THE
PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF
LONDON
1922.

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THE
PROCEEDINGS
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ENTOMOLOGICAL SOCIETY
OF
LONDON
FOR THE YEAR 1922.

Wednesday, February 1st, 1922.

The Rt. Hon. Lord ROTHSCHILD, F.R.S., etc., President,
in the Chair.

Vice-Presidents.

The PRESIDENT announced the Vice-Presidents for the
ensuing year to be Mr. R. ADKIN, Mr. E. C. BEDWELL, and
Prof. E. B. POULTON, D.Sc., F.R.S., etc.

Obituary.

The TREASURER read a letter from the Hon. N. C. ROTHS-
CHILD announcing the death of Mr. W. PURDEY of Thanet
Gardens, Folkestone, and a vote of condolence was passed to
his relatives.

The Rev. F. D. MORICE also gave a short account of the life
of the late Mr. F. W. L. SLADEN.

Election of Fellows.

The following were elected Fellows of the Society:—Dr.
R. E. McCONNELL, Arua, Uganda; Dr. H. T. FERNALD, Ph.D.,
Professor of Entomology, Massachusetts Agricultural College,
Amherst, Mass., U.S.A.; and Dr. ALFRED MOORE, M.D.,
31, Alfred Place, South Kensington.

PROC. ENT. SOC. LOND., V, 1922.

Exhibits.

The PRESIDENT, Mr. SHELDON, and Mr. ADKIN all brought for exhibition some remarkable series of *Cidaria truncata*, *C. citrata* and *C. concinnata*.

A BRITISH SAWFLY.—The Rev. F. D. MORICE made the following communication.

On July 21, 1921 I received from Miss E. Chawner, F.E.S., some cocoons formed by larvae of *Pristiphora pallipes* Lep., one of several sawflies which are specially attached to the gooseberry. She had obtained them from eggs laid in captivity on leaves of the food-plant by an unfertilised ♀, so that the whole brood was "parthenogenetic." From some of these cocoons imagines—all ♀♀—emerged during their journey from Lyndhurst to Woking. I placed them at once with some cuttings from my own gooseberry bushes in a glass-covered tin, and very soon saw them beginning to lay eggs. Six days later (July 27) the eggs had produced young larvae, which fed up very rapidly, and by Aug. 7 had almost all spun up either at the bottom of the tin or between leaves of the food-plant. In 6 more days, viz. on Aug. 13, imagines (again all ♀♀) began to issue from the cocoons, and lay eggs, from which I obtained another lot of larvae, which may or may not produce imagines next spring.

Hartig has estimated the average duration of a sawfly's life from leaving the egg to emergence as an imago as follows:—

1½ to 2 months from leaving the egg to forming the cocoon,

10 days to 3 years from forming the cocoon to pupation,

8 to 14 days from pupation to emergence.

I cannot find that he gives any figures about the time spent in the egg-stage. But leaving this out of account, it would seem that on his estimate the *minimum* time which the development of my insects from egg to imago ought to have occupied would be 63 days and the *maximum* 1,169 days. The time which it actually took, exclusive of 6 days spent by them as eggs, was 11 days as larvae feeding, and 6 in the cocoon—17 days in all!

I suppose that this extraordinary hastening of the process was connected in some way with the exceptional heat and drought of last summer. But I do not think that these conditions can

have been favourable to the development of sawflies generally. Out of doors, in their natural habitats, it has seemed to me that all through last year both larvae and imagines of sawflies were very much less abundant than usual. I often walked many miles without finding a single specimen on plants which usually produce them in quantities.

It would interest me to know whether Fellows who have been rearing larvae of the same or other Orders have had any experiences at all similar to my own.

ABERRATIONS OF BRITISH LEPIDOPTERA. —Mr. H. J. TURNER exhibited on behalf of Mr. THOS. GREER, of Stewartstown, Co. Tyrone, the following series of aberrations of British Lepidoptera.

Euchloë cardamines. (1) ♂ ab. *marginata*. (2) ♂ With the orange blotch streaked with black scaling. (3) ♂ Small form. (4) ♂ Large form. (5) ♀ ab. *radiata*. (6) ♀ With slight orange streaks on the R. fore-wing above and below.

Melitaea aurinia. ♀ Dull obscure form.

Pararge megera. (1) ♂ With apical ocellus reduced to a small dot. (2) ♂ With ocellus of fore-wing apex duplicated, and with the four fascia of the costa reduced to two.

Polyommatus icarus. (1) Gynandromorph: R. side ♀, L. side ♂. (2) ♂ With faint red marginal markings on hind-wings above, ab. *icarinus* below. (3) ♀ With marginal red spots extended and band-like.

All the specimens were from Co. Tyrone.

Mr. ASHBY exhibited some butterflies from Piedmont and said that he considered the Val di Bartelemi, close to Nus, to be one of the best collecting-grounds in Northern Italy.

Mr. J. H. DURRANT, on behalf of Dr. GAHAN, exhibited some living examples of the Cassid beetle, *Aspidomorpha sanctæ-crucis*, from India; the causes of the brilliant metallic coloration of this beetle were discussed by Mr. ARROW and by Mr. WILLOUGHBY ELLIS, and Dr. NEAVE commented on the habits of similar species in Africa.

Paper.

The following paper was read:

"Two new British species of *Hydroptila*," by MARTIN E. MOSELY.

Wednesday, March 1st, 1922.

The Rt. Hon. Lord ROTHSCHILD, F.R.S., etc., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society:—Mrs. MARGARET RAE, Courthill, Birkenhead; Dr. A. F. ROSA, M.D., 28, Pitt St., Edinburgh; Mr. FRANK RUSSELL, F.G.S., Auldham House, Workop; and Captain FRANCIS MOYSEY, Suffolk Regiment, attached Soudanese Battalion (Egyptian Army), Talodi, Nuba Mountains, Sudan.

Wicken Fen Fund.

The TREASURER made a statement on the Wicken Fen Fund. He called attention to the valuable work that is being done on this nature reserve, and made an appeal for contributions towards its maintenance.

Bequest to the Society.

The TREASURER announced that the late Mr. G. A. J. ROTHNEY had bequeathed the sum of £150 to the Society.

Obituary.

The PRESIDENT announced the death of Professor GELDART, and a vote of condolence with his relatives was passed.

Exhibits.

AN IMPORTED BEE IN BRITAIN.—Dr. J. WATERSTON exhibited an example of *Melipona scutellaris* Latr., taken on a flower head on Black Cliffs, Brighton, in July 1921, by Mr. Brazenor, and said that this bee, which in the present instance could only be a casual immigrant, is a native of Brazil.

Dr. Waterston also exhibited a portion of a reed stem of *Arundo phragmites* in which a Lepidopterous larva, *Nonagria dissoluta*, had been burrowing. This stem (fig. 1) presented a curious tuberculate appearance caused by the emergence at numerous points of the pupae of a Chalcid, *Geniocerus flavimanus* Thoms.

BUTTERFLIES FROM THE NILE.—Mr. H. MACE exhibited a number of species of butterflies from the neighbourhood of Khartoum in illustration of his paper in the Transactions.

A NEW VARIETY OF *DIAPHORA MENDICA*.—Mr. ROBERT ADKIN exhibited specimens of *Diaphora mendica* from Co. Tyrone, Ireland, for which he proposed the varietal name *venosa*. This local race most nearly approaches that known as *rustica* (of which a series of Co. Cork specimens was exhibited

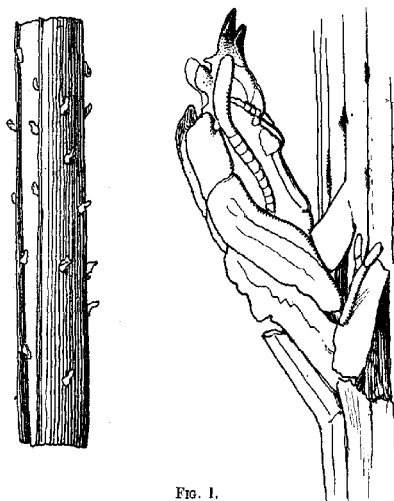


FIG. 1.

for comparison) of all the known forms of the species, but differs from it in the whitish-grey colour of the wings in both sexes and the darker grey of the veins, which in many of the specimens is very distinct. In the darker males (for as in var. *rustica* they vary in depth of colour) the tone is of a grey-brown as compared with the yellowish-brown of the latter form.

INSECTS FROM PIEDMONT.—Mr. E. B. ASHBY brought for exhibition numerous insects of various Orders taken in Piedmont, Italy, from July 25 to August 16, 1921.

THE UTILISATION OF DERIVED PLANT-PIGMENTS IN THE COLOURING OF LEPIDOPTERA.—Prof. POULTON drew attention to a paper on "Blue-Green Caterpillars," published November 1921, in the "Journal of Experimental Zoology" (Vol. 34, No. 3, p. 385), by John H. Gerould, Dartmouth College, New Hampshire. In the course of the author's breeding experiments, on *Colias philodice* Godt. about 45 blue-green caterpillars* appeared among about three times as many of the usual yellowish grass-green colour. Corresponding differences were seen in the pupae and in the eyes of the imago. The eggs laid by a female with blue-green blood (haemolymph) and eyes were pure white as compared with the normal cream-white. The empty pupal shell was pure white as compared with golden yellow. The cocoons of a Braconid parasite (*Apanteles flaviconchae* Riley) were pure white when the host was blue-green, bright yellow when it was yellow-green.

The interpretation was found in the fact that the blue-green caterpillars were unable to utilise the yellow constituent (xanthophyll) of the green colouring-matter of their food-plant (clover), but utilised the blue-green constituent (chlorophyll), while normal caterpillars utilised both. These derived pigments, present in a modified state in the blood or in the tissues or in both, accounted for the above-mentioned colours in the different stages, the yellow constituent being especially penetrating and especially persistent, for it alone reached the cuticle and it alone appeared in the Braconid cocoons.

The author also proved that the bluish tint is a Mendelian recessive and the yellowish dominant, but for the convincing evidence and many interesting details the paper must be consulted. A copy, by the author's kindness, has been presented to the Society.

In a later paper, read at the recent meeting of the American Assoc. for the Adv. of Sci. at Toronto, and kindly sent to Prof. Poulton in typescript, Mr. Gerould described an olive-green form of the same larva, recessive, like the blue-green, to the yellow-green. The olive-green effect was due to the pigment in the hypodermal cells, the blood being indistinguishable from that of the

* The blue-green caterpillars were also entirely without the pink line running along the centre of the spiracular white band.

yellowish larvae. The imaginal eye was also olive-green but of a paler shade than that of the larva. Although the blood appeared similar to that of the yellowish-green larvae, physico-chemical differences were probable—accounting for the changed colour of the hypodermis and the orange-yellow hue of the scale pigments on the under surface of the H.W. and tip of F.W.—parts most exposed during pupal development to the action of the blood.

The utilisation of derived plant-pigments in different ways by different individuals had been proved, not only in species like the above in which the power and its manifestation were hereditary and doubtless germinal in origin, but in species in which it was called forth as a response to stimulus. And in the latter the persistence of the pigments was as great as in the former. Indeed, in an example demonstrated 35 years ago the derived colour of a caterpillar, determined by the tint of the leaves of its food-plant, passed on into the young caterpillars of the next generation. As the record of this result is brief and not very accessible to Entomologists, it has been thought well to reprint it from the Proceedings of the Physiological Society at Oxford on July 2, 1887 ("Journ. Physiol.," VIII, pp. xxv, xxvi):—

"3. Mr. E. B. Poulton exhibited some ova of *Smerinthus ocellatus* and of *S. populi*, and some young larvae of the former species.

"The colour of the ova in both species was shown to correspond with that of the larval stage of the female moth which laid the eggs; and the young larvae are also similarly tinged immediately after hatching, although their subsequent appearance is known to be determined by their coloured surroundings. The colour of the eggs and newly-hatched larvae appears to strictly follow that of the female parent, and a similar correspondence was witnessed in the unfertile ova laid by unimpregnated females.

"These observations render it probable that the chlorophyllous pigments persist throughout all the stages of one ontogeny and are then handed down to the earliest stage of the next. . . ."

Now that this interesting subject was again being studied it

might be worth while to call attention to a note in our Transactions for 1886 (pp. 168-70) which, intermingled with notes on various other subjects, was likely to be overlooked. It was there shown that the opaque green colour of the larva of *Smerinthus ocellatus* was entirely due to the derived pigments stored in the hypodermis cells, the blood being only very faintly tinged. "Before pupation the pigments are withdrawn from the cells, and are dissolved in the (pupal) blood, which therefore possesses a concentrated solution of all the pigments that have passed through this medium during the whole of larval life. . . ."

Prof. Poulton took the opportunity of bringing before the Society Mr. Gerould's kind offer to give the benefit of his experience to English entomologists. He wrote on Jan. 21, 1922:—

"*Colias* is very favourable for a physiological analysis of heredity because we know already something about its pigments and can study them spectroscopically and experimentally.

"It is a curious thing regarding melanism in *Colias* that, while the chemical reaction that produces it is subject to seasonal control and appears in all winter individuals, certain members of the summer brood (cf. 'mutations' of *betularia*) show it, from one of which I now have a few descendants in hibernation. I take it that the chemical reaction is identical, whether brought out by cold or by chromosomal action.

"If any English entomologist will undertake to breed *C. edusa helice* I shall be glad to give him the advantage of my experience during the last dozen years with our white variety. Lethal factors or some disturbing causes have given me some interesting though puzzling data, upon which I am now working. *Helice*, I imagine, from what Harrison and Main published, may be more orthodox."

THE LATE DR. T. A. CHAPMAN ON GERMINAL "FACTORS" AND THEIR INDEPENDENT EXISTENCE AND DEVELOPMENT.—Prof. POULTON said that Mr. J. H. Gerould in the paper referred to above spoke of the sudden appearance of the blue-green caterpillars as a "new mutation," at once recalling to his mind the opinion he had heard expressed at our meetings by the late Dr. T. A. Chapman, F.R.S., that such sudden

appearances are not really new, but due to the reappearance of extremely ancient and, as it were, "buried" characters. This was also Mr. Gerould's opinion, for he wrote in the letter of which part has been already quoted:—

" 'New' mutations in my dialect are merely inheritable discontinuous variations, *new to science*. I agree with you entirely as regarding the two (blue-green and olive-green) as 'buried recessive characters' brought to light by inbreeding. Many of the mutants of *Drosophila* are of this sort. Geneticists, it seems to me, are coming to use the term mutation without reference to the time when the process behind it first occurred, and in a sense quite different from that used by De Vries. I believe that such intensive inbreeding of almost any insect as has been employed with *Drosophila* will bring out a similar array of 'mutations'."

"My olive-green strain probably came from a male imported from N.Y., close to the range of *eurythème* [Boisd.]. It may well be the 'revival of an ancient character,' of which you speak, derived from that wide-spread species from which *philodice*, I think, has sprung."

On Nov. 29, 1921, shortly before his death, Dr. Chapman wrote to Prof. Poulton on the same subject, enclosing a statement of his views on "factors," thus referred to in the accompanying letter:—

"I have been turning over in my mind for some years an idea concerning 'factors,' that I am afraid I shall never have time or energy to follow up more fully. I have tried to describe it briefly, and enclose the results for your consideration. In looking it over I fear brevity means obscurity. I do not know whether any one has elaborated the same idea.

"It is, that any particular factor in any particular species (plant or animal) has a quasi-independent existence, and can vary and be selected, etc., apart from all the other factors, of which the germplasm consists. That Mendelian factors arise in this way;—as a subsidiary point, that when any factor is divided into two races (Mendelian or still miscible) one of these (either?) may recede much deeper than a Mendelian recessive, but still exist and be capable of declaring itself on occasion."

The note enclosed in Dr. Chapman's letter is printed below:—

"Many names have been given to the representatives in the germplasm of the various characters of the adult organism, genes, biophores, etc. : it will be simplest to call them 'factors,' as that is a term with which we are perhaps most familiar and with which there has been more elaboration of hypotheses than with almost any other.

"The hypothesis that I wish to suggest with regard to factors is not concerned with what they actually are. My own belief is that a factor is represented in the germplasm by a differentiation in the structure (chemical, organic or what not) of every molecule of the plasm; that it is present in every portion of the plasm. The hypothesis would perhaps be more easily seized and discussed if we accepted the view that a factor is something that could be separated from the rest of the germplasm, and the factor present in any zygote could be extracted and exhibited on the point of a needle.

"Let it be admitted that in talking of a factor we are talking of something that actually exists and may be discussed in very similar terms, whether it be merely a variation in structure of the whole protoplasm, or as a distinct and separable item.

"In defining a species, the most distinct character determining that two species are two species and not forms of one, is, that they are not syngamic. We meet, however, with abundant cases where this test gives a doubtful result. The two forms may be more or less fertile together, and the question whether they are two or one species has to be decided on other grounds, or left undecided, except in the opinions of individuals according to their idiosyncrasies.

"It is suggested as a hypothesis that factors act towards each other on the same principles, whatever they are, on which species act. To be a little more definite, the factors for some particular character, in two portions of germplasm of two different individuals, may combine freely, or may refuse to combine, or may present relations to each other that are intermediate in different degrees between these two extreme attitudes.

"The factors that refuse to combine and so produce intermediate forms are those that form the subjects of Mendelian research.

"How do they acquire this antagonistic position to each other? The answer must be in the same way that species acquire immiscibility, viz. by *natural selection acting on variation during periods of segregation*.

"Thus the factor for height in peas becomes in one race a factor for tallness, in another a factor for shortness, which prove to be immiscible. On the other hand, the factor for human skin colour, that one would expect to be more immiscible than that for height in peas, proves to be (invariably?) quite miscible.

"To account for such differences, we may appropriate any available explanations from the cases of possible species being more or less fertile *inter se*. In the case of Mendelian factors we may suppose that the selection has gone on long enough to give the two forms of a factor specific rank as against each other, just as it does in the case of any plant or animal. Where miscibility exists we may suppose the necessary selection has not continued long enough to secure fixity. We must probably call in another element about which, however, little is known. The two factors may be chemically (or otherwise) incapable of combining together. One would suppose this capable of arising more easily where the new variety arose by mutation, more difficult to picture as a result of gradual change by selection.

"The broad view would be that each species has a germ-plasm consisting of an enormous number of factors, each of which can act on its own part and without similar action on the part of other factors, as if it were a species liable to variation and selection. When the plasm of any two races (of plant or animal) presents a sufficient number of differentiated factors, or, more probably, when some important factors are sufficiently differentiated, the two races become distinct species.

"One may regard Mendel as having been especially fortunate in selecting for experiment the garden pea, which has an unusual number of easily recognised differentiated factors. It might be supposed that the garden pea has not been in

culture long enough for such differentiation to occur: it is, however, very possible that such differentiation was already established before the pea was taken into cultivation, and, in any case, the pea obtains very complete segregation by its method of fertilisation, so that segregation easily takes place without any geographical separation or any special care, and its results may appear more quickly than in forms that tend to continual crossing.

"There is a series of facts that are connected with this view of factors, but do not necessarily support or weaken it. These depend on what may be described as factors that are not recessive in the Mendelian sense, but in a much wider and deeper manner. The facts of melanism in Lepidoptera may be used to illustrate this.

"Early in the evolution of the Lepidoptera dark coloration would be very useful as assisting inconspicuousness, either on dark surfaces or amongst unlighted surroundings, and consequently many species no doubt acquired factors for melanism of one sort or another. When no longer useful the melanic factor must often have died out, and one cannot guess how often it may have been acquired and lost in any one Lepidopterous stirps. Melanism, however, crops up so often in individuals, sporadically, and is usually heritable, that it seems necessary to suppose that the factor for melanism has been present for many generations, or possibly ages, without declaring itself. Probably, however, sporadic examples have occurred, unobserved and unrecorded, throughout the whole period. Many other variations in Lepidoptera that are found at rare intervals are due to similarly receded factors—'buried' might describe them, perhaps, better than receded.

"The Tephrosiæ and allied Boarmiinae, which have, in so many species, developed melanism in our manufacturing districts, have given rise to an idea that must be erroneous—viz. that melanism has under our eyes originated *de novo* in each of these species. It is much more probable that these species have assumed and dropped the melanic facies many times, back perhaps to the time of their common ancestor, who possibly did so. They are a group that have the habit of resting on tree-trunks and rocks, and the wetness or dryness

of the local climate made them less or more conspicuous according as they happened to be dark in a wet climate, pale in a dry one, or *vice versa*, the eclipsed factor being for the time buried deeper than is implied in 'recessive' as used Mendelially. It is generally (always?) the case that the species exhibiting this resuscitated melanism presents it as a Mendelian alternative to what we regard as the normal form, which it would not do were it recently acquired by selection."

Prof. Poulton said that the chief difficulty he felt on reading carefully this most interesting and suggestive note was in Dr. Chapman's "belief that a factor is represented in the germplasm by a differentiation in the structure . . . of every molecule of the plasm; that it is present in every portion of the plasm" (p. x)—words that were somewhat difficult to reconcile with those that immediately followed them; as also with the hypothesis that "the factors for some particular character, in two portions of germplasm of two different individuals, may combine freely," etc. (p. x); and especially with the "broad view . . . that each species has a germplasm consisting of an enormous number of factors" (p. xi). To suppose that every one of this enormous number was represented in every molecule of the plasm called up a vision of bewildering complexity.

To refer to one other conclusion (p. xii)—a Mendelian recessive, if present in a sufficiently small proportion of the population would seem to provide a burial so deep that a character might lie hidden for ages. On the other hand, hidden characters, like the melanism of *betularia*, were often Mendelian dominants and would appear when heterozygotes no less than when pure, so that here some form of deeper than Mendelian burial might be a necessary hypothesis.

As regards the suggestion that factors "acquire immiscibility . . . by natural selection" (p. xi), he had always believed that the growth of a complex mimetic pattern had been along these lines—viz. at first small variations—non-Mendelian; then, as by selection these became larger and larger, a point was reached when they followed the Mendelian rules. This could probably be tested in the primitive female forms of *Papilio dardanus* Brown, at Nairobi.

He had hoped for Dr. Chapman's opinion upon some of these comments, but the letter containing them was too late for a reply.

NOTES ON THE METAMORPHOSES OF *ONTHOPHAGUS TAURUS* L.—MR. HUGH MAIN, whose remarks were illustrated with some very striking lantern slides said :—

Fabre devoted a good deal of attention to the genus *Onthophagus* and particularly to *O. taurus*. When rearing this species at home from specimens taken last May at La Sainte Baume, in Provence, I found various divergencies from the details given in the "Souvenirs Entomologiques" which it might be of interest to put on record. Whether some of these are entirely due to the change of climate or not requires further investigation.

Fabre gives May as the nesting month, but mine did not start work till July. The insects were reared, some in flower-pots, others in subterraria such as I have previously described in our Proceedings. No special observations as to the formation of the food-masses and oviposition were made, but on examination of a cell on July 30, the egg was seen fixed at one end to the top of the hatching cavity, and projecting downwards (Fig. 1). In his earlier work Fabre says the nest has the food-mass occupying the base, and the cell containing the egg at the top. Later he describes the "birth chamber" as being at the bottom with the egg fixed on the wall, sometimes at the bottom of the cell and sometimes on the side, standing on its hinder end and projecting into space.

The egg when photographed was nearly ready for hatching, the dark jaws of the larva being visible through the transparent covering near the free end. The food-mass had been formed at the bottom of a flower-pot beneath the earth and built against a stone, as described by Fabre. By August 15 some larvae were nearly full-grown. They showed the large hump on the back which Fabre described as a "store-house of cement" (Fig. 2). He says: "The larva growing plumper and plumper and more and more humpbacked withdraws to one end of the cell which has become a crumbling ruin. Here it builds a casket in which the transformation will take place. Its materials are the digestive residuum converted into

mortar and heaped up in the hump." A large cavity has been made by the larva consuming its provisions, and this has to be reduced to small dimensions so as just to hold the pupa comfortably.

The wall of the cell was removed on one side for the purpose of photographing the larva which then began at once to rebuild the wall from its stercoral cement, which it discharged and moulded into position with the assistance of its mandibles. It soon closed itself in, and was allowed to rest quietly for a few days (Fig. 3). On again opening up the cell, the larva, of a beautiful clear white, "with its body emptied of all dross" is seen to occupy nearly the whole of the reduced interior whose smooth plastered wall was formed from the balance of the mortar (Fig. 4).

The first pupa was noticed on Aug. 27, "half-transparent and as it were carved out of crystal" (Fig. 5). Fabre gives the first week of July as the date for observing the "nymph" as he calls it. Unfortunately all my pupae except one were those of females. Both sexes have, however, certain structures which gave Fabre occasion for much speculation as to their use.

He says: "On the front edge of the corselet, a single horn arises, shaped like a cylinder ending in a conical knob. It points forward and is fixed in the middle of the frontal crescent, projecting a little beyond it. To right and left the abdomen is armed on either side with four little horns resembling crystal spikes. What does the insect propose to do with these excrescences? Nothing at all. They are passing fancies, jewels of early youth; the adult insect will not retain the least trace of them. When the nymph sheds its covering and the delicate tunic of the adult form is rent, these strange horns crumble into fragments with the rest of the cast clothing. In the hope of finding at least a trace of the vanished things the lens vainly explores the bases but lately occupied. There is nothing appreciable left; the nymph is now smooth; the real has given place to the non-existent."

Fabre follows this account with speculations as to the "motive of this horned magnificence," and advances various surmises on the subject. He says that none of the *Onthophagi*

has succeeded in hardening the nymphal thoracic prominence into a permanent horn, but, as pointed out by Mr. G. J. Arrow, some tropical species certainly possess a horn on the thorax.

Fabre concludes his chapter with the following words. "Then what is the meaning of these horny preparations which are always blighted before they come to anything? With no great shame I confess I have not the slightest idea. My reply may not be couched in learned phraseology, but it has one merit, that of absolute sincerity."

Examination of a cell which has been kept in the position in which it was formed by the parent, and in which the pupa has been formed undisturbed, discloses the solution of the problem that puzzled Fabre. He had dug up cells from his breeding cages and opened them without taking note of their proper orientation. He thus missed seeing the pupa in its normal vertical resting position, supported on the extremity of the projecting horn, with all the remainder of its delicate body free from contact with the surrounding wall. Only the tip of the tail assists in balancing it on its support (Fig. 6).

There is no doubt that the horn is similar in function to the various spines and bristles that appear on various parts of the pupae of other Coleoptera, viz. to keep the delicate organs out of contact with their surroundings while they are being fully developed.

Insects reared in subterraria allow of easy observation of their various stages exactly as they appear in nature. Clues are thus obtained to the meaning of structures, which otherwise might be missed.

The perfect insects were produced during the month of September.

Papers.

The following papers were read:

"Gynandromorphous *Plebeius argus* L.," by Dr. E. A. COCKAYNE.

"Butterflies from the Nile," by Mr. H. MACE.

"Types of Oriental Carabidae," by Mr. H. E. ANDREWES.

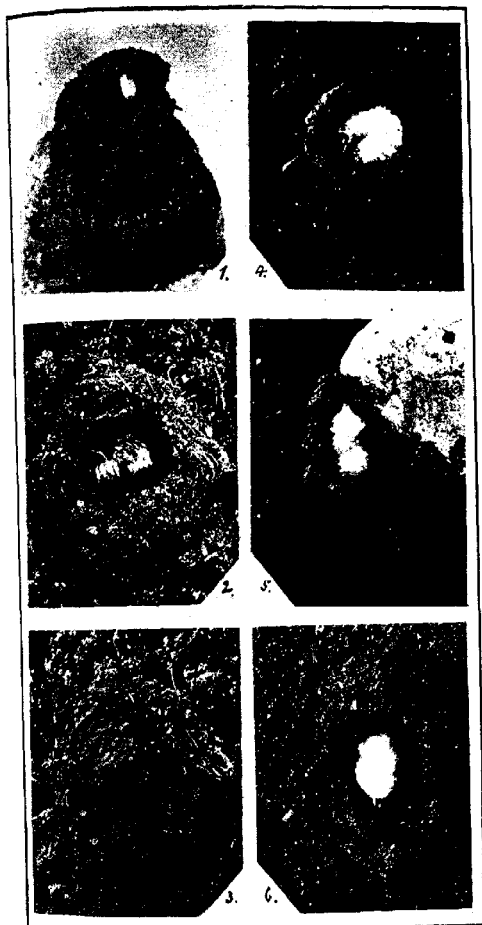
"New Genera and Species of Neotropical Curculionidae," by Dr. G. A. K. MARSHALL.

EXPLANATION OF PLATE A.

Metamorphoses of *Onthophagus taurus* L.

- FIG. 1. Ovum in hatching chamber.
2. Larva, full-fed, seen in opened cavity in food-mass.
3. Same food-mass after larva had repaired wall.
4. Larva awaiting pupation.
5. Pupa, showing anterior and lateral prominences.
6. Pupa in normal resting position, vertical in cell, resting on thoracic prominence.

All $\times 2$ diams



Hugh Main, photo.

Wednesday, March 15th, 1922.

Prof. E. B. POULTON, M.A., D.Sc., F.R.S., etc., Vice-President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society:—
Mr. REGINALD CHARLES TREHERNE, Department of Agriculture, Ottawa, Canada; Mr. T. G. SLOANE, Moorilla, Young, New South Wales, Australia; Mr. WILLIAM MONOD CRAWFORD, B.A., Orissa, Marlborough Park, Belfast; Mr. LEONARD CHARLES BUSHBY, 11, Park Grove, Bromley, Kent; Mr. ARTHUR MOREL MASSIE, Park Place, The Common, Sevenoaks, Kent; Mr. LINNAEUS GREENING, Fairlight, Grappenhall, Cheshire; Dr. FRANCIS ARTHUR, M.R.C.S., L.R.C.P., 395, Bethnal Green Rd., E. 2; Dr. H. SILVESTER EVANS, M.R.C.S., L.R.C.P., Lomaloma, Fiji; Mr. JOHN WILSON MOORE, 151, Middleton Hall Rd., King's Norton, Birmingham; and Mr. JOHN EDMUND EASTWOOD, Wade Court, Havant, Hants.

Exhibits.

INSECTS FROM MOUNT EVEREST.—Mr. W. H. TAMS exhibited and made remarks on a selection of insects, chiefly Lepidoptera, taken on the Mt. Everest expedition.

A NEW BEETLE AND RARE MOTH FROM MADAGASCAR.—Mr. O. E. JANSON exhibited specimens of a new and very distinct species of *Euchroea* recently received from Madagascar, and also from the same country a bred female of the rare, giant Saturniid moth, *Argema mittrei*, with the cocoon from which it emerged.

REGENERATION OF LIMBS IN CARAUSIUS MOROSUS.—Dr. C. J. GAHAN exhibited a dead specimen of the well-known Indian Phasmid *Carausius morosus* in which homoeotic regeneration had taken place, an amputated antenna having been replaced by a tarsus. The specimen was one of a series on which the late Dr. T. A. Chapman had been experimenting some time before his death. So far as he could gather from some rough notes made by Dr. Chapman, which had been

handed over to him, along with the specimens, by Mr. T. H. Grosvenor, the antenna of the specimen shown had been amputated near the base when the insect was in its first or second instar. In a second specimen of the same series, which is still alive in the Natural History Museum, regeneration of exactly the same kind had taken place. In each case two or three tarsal joints, including the claw-joint, with its claws and pulvillus, are quite distinct, and their character is unmistakable.

THE CHALCID *SYNTOMASPIS DRUPARUM* DALM., BREED BY MR. HAMM, FROM HAWTHORN SEEDS IN BIRDS' DROPPINGS.—Prof. POULTON, exhibiting the seeds and Chalcids (Torymidæ) which had emerged from them, said that Mr. A. H. Hamm's observations recorded below were prompted by Dr. J. Waterston, who had kindly determined the species referred to in this and the following note:—

"Between November 17 and December 16, 1919, over 2000 hawthorn seeds from birds' droppings were collected from under hawthorn trees in the grounds of the Oxford University Museum. The seeds had almost certainly come from black-birds, which were constantly seen picking and eating the fruit. By December 17 nearly all the berries had been stripped and the trees were deserted.

"The seeds, separated from extraneous matter, were looked at from time to time up to the present date (March, 1922), and on August 26, 1921, a single female Chalcid had emerged and was found dead. It could only recently have died, as I was enabled to set it with scarcely any relaxing.

"A number of uneaten berries accidentally dropped by the birds in plucking from the trees, were also collected. These have been looked at from time to time, but nothing has so far emerged from them.

"In the course of a walk near Old Hincksey, Oxford, on December 13, 1919, a number of birds' droppings containing hawthorn seeds were picked up, several mistle-thrushes being disturbed feeding during the search. Looked at occasionally since December 1919 a single female Chalcid was found alive on June 15, 1921.

"I have since separated the seeds from the other matter

with which they were mixed, and found the number to be 112.

"I also noticed large numbers of seed-coverings, nibbled and split, apparently by field-mice, which had extracted them from the birds' droppings. These small rodents had evidently taken advantage of the fact that the pulp had been removed, and no doubt many seeds were taken away and stored for future use."

CHALCIDIDAE BRED BY MR. J. COLLINS FROM BEETLES IN DOG-BISCUITS AND PLUM-BRANCHES.—Prof. POULTON exhibited two ♀ specimens of *Lariophagus distinguendus* Först. (Pteromalidae), found alive by Mr. Collins among living *Pinus tectus* Boield., in broken-up dog-biscuits from Mr. Best's house.—The Firs, Summertown, near Oxford (September 26, 1921). The beetles, also exhibited, were in far larger numbers than their parasites.

Also two ♀ *Elachertus* (*Entedon*) *leucogramma* Ratz. (Eulophidae, Entedoninae), and three *Scolytus rugulosus* Ratz., bred in June 1921 by Mr. Collins from a plum-branch received from Mr. Ashe of Hartlebury, near Worcester. The proportions of host and parasite were as in the preceding examples.

A NEW POINT IN THE PROCRYPTIC RESTING ATTITUDE OF POLYGONIA (GRAPTA) C-ALBUM L.—Prof. POULTON said Dr. R. C. L. Perkins, F.R.S., had written to him on January 8, 1922, from Newton Abbot:—

"My youngest boy, who has become a very keen Lepidopterist, and I were breeding some Comma butterflies this year, and I made the enclosed rough outline drawing of one in the resting position. Later I was reminded of this on reading your remarks about the white C [Trans. S.E. Union Sci. Societies, 1921, p. 8; also Proc. Ent. Soc. Lond., May 6, 1903], and I have just come across the sketch. You will see that if the edge of the closed wings, instead of the broad surface is looked at, a most wonderfully vegetable-like growth is represented, owing to all those lobes on the wing not meeting flatly, but being turned outwards. The appearance is that of numbers of little leaflets rising up from a stem beneath them. The outline of this specimen I made with *camera lucida*, and it only feebly shows the plant-like appearance of

the edge. No doubt our other *Vanessas* show this to a greater or less extent. I suppose it would have been classed by Brunner as 'hypertely.'"

A few days later Dr. Perkins wrote:—

"I cannot describe the curious way in which the leaflet-like projections appear, as if they might arise on more or less erect stalks. The appearance to me was not that of dead leaves at all.

"I think the commoner *Vanessas* will nearly all reproduce this appearance to a conspicuous extent, as I particularly noticed it in the case of a resting specimen of one of these—probably either *urticae* or *atalanta*, after seeing the *Commas*.

"The specimen I sketched was drawn, I believe, on the morning after the day it emerged, but I looked at all the 8 or 9 we bred, and the appearance was much the same in each.

"I fear I did not look at the *Commas* *obliquely*, so that the margin as well as the dead-leaf surface could be seen. I was so astonished at seeing the strange appearance of what is usually a thin edge, as such an edge would appear sufficiently invisible."

Dr. Perkins' drawing was exhibited to the meeting together with a male specimen of *c-album* which had been found hibernating in a shed at Oxford and had died in the position of rest, showing the appearance described above. The wing-edges of a second male, found a few weeks later on the railings of the Oxford University Parks, by Commander J. J. Walker, were bent outwards to a far less extent than in the exhibited individual.

The main significance of Dr. Perkins' extremely interesting observation—also made last year by Commander Walker—was, Prof. Poulton believed, to be found in the oblique views of the insect, and the view from the side, rather than in that from the edge. Inspection of the exhibited specimen showed that the jagged-leaf appearance was greatly enhanced by the out-turned edges when seen obliquely from the side, the number of visible projections being doubled and the effect further increased by the bending in two different directions instead of the maintenance of the plane of the wings. The effect was, of course, less marked from the direct side-view,

but even here when a nearer projection exactly covered a more distant one, the other pairs would be more or less "out of register."

It was obvious that in all these side views more or less of the upper surface of the more distant wings was visible, overlapping the edges of the nearer under surface. It was probable that we found here the interpretation of the broad dark margin of the upper surface in all the jagged "Commas" of the Palaearctic and Nearctic Regions—a modification of pattern which results in a dark upper surface being seen beside a dark under surface in side views of the position of rest. Looking at the patterns of closely related *Vanessidae* from this point of view it appeared probable that edges markedly out-turned like those of the *Commas* would only be found in *polychloros* and its allies.

The feature observed by Dr. Perkins was presumably a permanent character of the hardened wing-membrane, but it would be interesting to confirm this by looking at the expanded wings of the living butterfly. The drying of the wings and mode of appearance of the feature would also be well worth investigation.

It was extraordinarily interesting to find new observations, like these of Dr. Perkins, made upon one of our best and oldest known species.

Dr. S. A. NEAVE read a letter from Mr. W. J. Harding regarding the capture of *Polygonia (Grapta) c-album* at Holcombe in Devonshire, and some discussion took place as to the distribution and recent spread of this butterfly in the south of England.

Wednesday, April 5th, 1922.

The Rt. Hon. Lord ROTHSCHILD, F.R.S., etc., President,
in the Chair.

Election of Fellows.

The following were elected Fellows of the Society:—
Messrs. WILLIAM GEORGE CLUTTEN, 136, Coal Clough Lane
Burnley; EDMUND JAMES PEARCE, The Lodge, Corpus
Christi College, Cambridge; GEORGE E. HUTCHINSON, Ays-
thorpe, Newton Rd., Cambridge; CHARLES H. LANKESTER,
Cartago, Costa Rica; ARTHUR D. R. BACCHUS, 29, Abbotsford
Rd., Redland, Bristol; and Captain DOUGLAS S. WILKINSON,
Kennington Vicarage, Ashford, Kent.

Exhibits.

MIMETIC INSECTS.—Lord ROTHSCHILD exhibited a group
of mimetic Lepidoptera and Hymenoptera and made the
following remarks:—

“The insects I exhibit—3 species of Amatidae (Syntomi-
dæ) of 2 genera and 1 species of Aegeriidae of the order
Lepidoptera, a species of Braconidae (parasitic Hymenoptera)
and a species of Vespidae of the order Hymenoptera—all
show the same colour pattern, viz. black or brown with the
apex of the fore-wings white. In addition to those exhibited
there are 4 other Hymenopterous insects showing the same
colour pattern, viz. *Monobia apicaliformis* Sauss. (Eumenidae)
and *Iphiaulax (Ipobracon) semialbus* Szep., *Ipobracon* sp.
and *Microdus simulatrix* Cam. (Braconidae). In the case
of the Lepidoptera, the resemblance to the wasp is apparently
protective, but the examples of the Braconid parasites are
more obscure, though the resemblance to the wasp with its
formidable sting is also probably protective.

“The species exhibited are Amatidae: *Pompyliodes albo-
marginata* Druce, *Pompyliodes aliena* Wlk., and *Ancytes
anthracina* Wlk. Aegeriidae: *Aegeria* sp. (Lepidoptera).
Vespidae: *Parachartergus apicalis* Fabr. Braconidae: *Ipo-
bracon* sp. (Hymenoptera).”

BUTTERFLIES FROM CO. TYRONE.—Mr. W. G. SHELDON exhibited on behalf of Mr. T. GREER a series of *Epinephile jurtina* approaching the South European form, *hispulla* Hb., and a series of *Pieris napi*, spring and summer broods, both of which showed much dark suffusion on the uppersides. In both generations forms occurred with ochreous ground-colour to the wings, and in which the veins on the undersides were almost equally coated with fuscous scaling.

ZELLER'S TYPES OF CRAMBIDS.—Mr. A. W. PICKARD-CAMBRIDGE brought for exhibition Zeller's types of a number of moths, mainly Crambids, from Egypt and Palestine. He also exhibited aberrations of *Argynnis cydippe* and of *Zygaena* ? *transalpina*.

COLAENIS TELESIPHE.—Mr. W. F. H. ROSENBERG exhibited a specimen of *Colaenis telesiphe titraustes* Salv., in which the band of the hind-wing is white as in *C. t. telesiphe* Hew. This specimen was taken at Rio Pastaza, Eastern Ecuador, in company with typical yellow-banded specimens of *C. t. titraustes*. The band on the hind-wing is broader than in Peruvian specimens of the white-banded *C. telesiphe*. Peruvian and Bolivian specimens of *C. telesiphe* have hitherto been generally considered as *C. telesiphe telesiphe*, as distinct from the yellow-banded *C. telesiphe titraustes* of Ecuador. But Hewitson's type of *C. t. telesiphe* in the B.M. is from Ecuador, unfortunately without exact locality. The narrow-banded form from Peru and Bolivia, therefore, appears to require a new name, as pointed out to the exhibitor by Captain RILEY.

LEPIDOPTERA FROM FLORENCE.—Mr. BETHUNE-BAKER exhibited a series of the fifth generation of *Heodes phlaeas* from Florence which began to emerge on October 21, 1921. The specimens were of the typical *spring* emergence, but were unusually small.

He also showed from the same district a specimen of *Zygaena transalpina* ab. *elongata* and another very beautiful, suffused specimen of the same species, the red suffusion being confined to the left wing. In addition a specimen of *Z. angelicae* v. *ochsenheimeri* was exhibited and was a very pretty pale yellow form.

MIMETIC GRASSHOPPERS.—Dr. G. A. K. MARSHALL, on behalf of Mr. B. P. UVAROV, exhibited some remarkable mimetic long-horned grasshoppers with their Cicindelid models from Java and Celebes, pointing out that the mimetic resemblance is present in the larval stages only.

A MOTH WITH A STRIDULATORY APPARATUS.—Dr. K. JORDAN exhibited a pair of the Agaristid moth, *Aegocera mahdi* Pagenst. (1903), from East Africa and drew attention to the hitherto unknown ♂. This sex has a stridulating organ in which the hind-wings and hind-legs participate. The wing-portion of the organ consists of an elongate semivitreous stripe occupying the greater part of the cell of the hind-wing; on the underside the subcostal vein is swollen and non-scaled, projecting much more than in the ♀ and being slightly curved. In the hind-leg the first tarsal segment is likewise swollen and bears on the upperside a naked stripe on which a number of very shallow transverse grooves are visible. The structure renders it evident that during flight this tarsal segment plays across the inflated subcostal of the hind-wing. No observations on the sound produced have as yet been made by the collector of the specimen (W. Feather).

Dr. Jordan added that last summer he had had an opportunity of examining *Pemphigostola synemonistis* Strand (1909) placed by Strand in the Castniidae as a new sub-family and referred to in our Proceedings of 1921, p. xxxiv, as probably being an Agaristid. This opinion proves to be correct. *Pemphigostola* is a genus of Agaristidae belonging near *Aegocera*.

Dr. Jordan further exhibited a number of specimens of the interesting Lycaenid, *Liphyra brassolis* Westw. (1864), from various localities and a ♂ of the second species of the genus, *L. castnia* Strand (1911), obtained in the Hydrographer Mts., British South-East New Guinea. *L. castnia* is distinguished, *inter alia*, by its more rounded hind-wing, very short palpi and the transverse position of the black patch on the underside of the fore-wing.

Dr. S. A. NEAVE gave an account of the fauna of Mt. Manje, Nyasaland, and illustrated his remarks with lantern slides and with an exhibition of some typical insects from that locality.

Wednesday, May 3rd, 1922.

The Rt. Hon. Lord ROTHSCHILD, F.R.S., etc., President, in the Chair.

Obituary.

The PRESIDENT announced the death of Mr. A. W. Bacot, while engaged on typhus research in Egypt, and also of Mr. Gilbert Storey, of the Department of Agriculture, Cairo, Egypt, and a vote of condolence to their relatives was passed.

Election of Fellows.

The following were elected Fellows of the Society:—Mr. C. L. COLLENETTE, c/o Messrs. Barker & Co., Singapore; and Mr. MICHAEL G. L. PERKINS, 4, Dean's Yard, Westminster Abbey, S.W. 1, and Trinity College, Cambridge.

The Collection of Portraits.

The TREASURER called attention to additions to the collection of portraits in the meeting room, and especially to a beautiful pencil drawing from a photograph of the late Dr. Longstaff.

Exhibits.

BUTTERFLIES FROM RUMANIA.—Mr. W. G. SHELDON exhibited a series of *Pararge rozelana* from Herculesbad, and of *P. climene* from Sarepta, and noted the segregation of the sexes in these species in a state of nature.

Comments on this exhibit were made by Comm. WALKER and by Miss FOUNTAINE, who described some of her personal experiences of capturing *P. climene*.

THE LIFE-HISTORY OF CATOCHRYSOPS PHASMA BUTL., etc.,—Prof. POULTON said that he had received a letter, dated March 14, 1922, from Dr. A. Connal referring to the note on p. 401 of Trans. Ent. Soc. Lond., 1921. The following passage shows that the failure to receive a reply was in no way due to Dr. Connal, but must be attributed to the post:—

"I can assure you that I answered your letter and now repeat the gist of what I wrote. As you will see from Farquharson's letter, which I enclose, he made very complete arrangements. But what happened was that Farquharson himself on the day before he sailed left three small tins of larvae with me. His boy, Joe, brought neither larvae nor food, nor did any come by train, with the result that all the larvae died without having shown signs of pupation."

The letter from Farquharson, dated August 28, 1918, contains the following passage—somewhat shortened—together with two other references to observations published in the 1921 Transactions:—

"I wished to give you some insects in the hopes that some of them will complete their life-histories in a few days after I leave. In any case I'll trust to your good nature and send them to you by Joe, and have arranged for tins of the chop plant to be sent you by every down train till they are fully fed. As a matter of fact the expectation is that they will die, for it is possible that they cannot complete their life-histories without passing a part of their lives *chez* the ant *Camponotus maculatus*. If they pupate the imagoes will emerge ten days later."

The letter also referred to the *Dermestes* larvae he intended to leave (p. 436), adding that "one or two Diptera may also breed out"; and in conclusion he promised to send Mrs. Connal a box of chocolates for Christmas "if that beast is a *Ceratopogon* and not a *Cecidomyiid*" (p. 441).

NOTES ON THE LIFE-HISTORY OF A BETHYLID (HYMENOPTERA) OF THE GENUS *CEPHALONOMIA* WESTW., OBSERVED AT OXFORD BY MR. A. H. HAMM. THE BETHYLIDAE ARE FOSSORIAL ACULEATA.—Prof. POULTON gave an account of the following remarkable observations by Mr. Hamm and exhibited the specimens referred to together with the type material of *Cephalonomia formiciformis* Westw.:—

"The minute female Hymenopteron (Bethylidae) exhibited to the meeting was captured on August 4, 1918, in my garden, 22, Southfield Road, Oxford. She was walking on an old post a few inches from the ground, carrying in her mandibles a Coleopterous larva (? *Cis*) at least six times her size and

probably more than that number of times her weight. The captor and prey were placed in a small glass-bottomed box and looked at from time to time during the following two days. On each occasion she was seen to be carrying the larva just as when first captured, holding it with her mandibles by the posterior end near the anus, so that it projected well in front of her head. In spite of the apparently cumbersome burden carried high in the air, she moved about with the greatest facility. Although the larva was alive its movements were extremely feeble, in fact more like those of one that had been stung by a Fossorial wasp.

"Late on August 6 I was reluctantly obliged to kill her, as I was leaving home for a fortnight. She was still carrying the larva when I stifled her with a drop of benzine, but this did not injure the prey. I thought I could see several ova attached, but these, when examined under a $\frac{1}{2}$ -inch objective, turned out to be four larvae symmetrically placed one on each side of the second and third thoracic segments of the victim. It therefore became clear that the mother had been carrying about the larva with her offspring attached and feeding.

"On my return home on August 20 they were still attached to their host and had evidently been feeding throughout in the same position. On the following day the larvae had left their host and had spun small white silken cocoons in a cluster on the edge of the box. The cocoons were examined at frequent intervals, and on October 4 imagines were found to have emerged from all four, and were quite active.

"The Bethyid almost certainly belongs to the genus *Cephalonomia*, described by Westwood in Loudon's Mag. Nat. Hist., vol. vi, 1833, p. 420, but it is doubtful whether the species is Westwood's *formiciformis*, loc. cit."

Mr. HAMM's doubts as to the specific identification of the insects were confirmed by Dr. J. Waterston, to whom I submitted the specimens together with Westwood's type material. He kindly wrote on April 10, 1922 :—

"Hamm's *Cephalonomia* runs down, according to Kieffer's tables (Tierreich, 41, p. 242), to *C. mycetophila* Kieff., a French species with which I am not acquainted.

"The differences between *mycetophila* and *formiciformis*,

according to Kieffer, are mainly in the neurulation. Hamm's specimens show a distinct median vein as well as a basal. These are said to be absent in *formiciformis*, but Westwood's type is too clogged up with gum to permit the wings to be seen distinctly. Still I think Kieffer is probably right in what he says. On the other hand, he declares in his key that the scutellum of *formiciformis* is 'without a cross furrow,' which in my opinion would be remarkable. I find, however, that Westwood's type *has* the cross furrow, so that in one point at least Kieffer is inaccurate. How far one can trust him in other respects I don't know. And there is, of course, the further question of the value to be attached to such differences as he has noted. I hope later to take up the genus *Cephalonomia* when completing my work on grain pest parasites. I shall then be glad to go most fully into Hamm's interesting material. Meantime I can only say that I do not feel justified in referring these specimens to Westwood's genotype."

The habits described by Mr. Hamm confirmed the account given by A. H. Haliday in the Ent. Mag. II, pp. 219-221 (1835). He here stated that on the 5th of "last" June, presumably in the year 1833 (for his paper appeared in the number published April 1834), he observed a female Bethyid carrying a full-fed Tineid larva at the sand-cliffs, doubtless in the neighbourhood of Dublin. The Bethyid had seized its victim by the underside of the mouth so that it was dragged along on its back, and on one occasion when a different hold had been taken and the larva's ventral surface was undermost, inconvenience was caused by the feet grasping objects on the ground. But the Bethyid quickly discovered its mistake and took a new hold in the usual position. The larva was, Haliday believed, about six times the weight of its captor, and it was being carried up the sliding sides of a pit in the sand. The efforts of the Bethyid and the use it made of grass, twigs, etc., to aid its ascent are described in much detail. When it had climbed up about two feet it came to a piece of reed partly buried in the sand and open at its lower end. Here it fixed its prey between two shreds of leaf, explored the bank, descended the reed, entered the hollow stem from below,

came out again, seized the larva in the usual place and began to carry it down the reed. Then once more it fixed the larva, examined the hollow, returned and dragged the larva to the opening, again left it and "plunged in itself, but immediately reappearing, drew in the larva head foremost, speedily disappearing in the interior." At this point Haliday left the insect, but records the conclusion that in all probability "the bore of the reed was employed instead of an artificial funnel, for the cells which should contain the progeny of the *Bathylus*, with its store of provision."

It was possible that Mr. Hamm's Bethylid was engaged, just like Haliday's, in seeking for a hole, but being confined in a box and unable to follow the normal instincts, it laid eggs on the prey and continued to carry it about after they had hatched. It was to be hoped that the observation might be repeated under conditions which would permit of the prey being stored.

Dr. David Sharp, F.R.S. ("Insecta," I, pp. 535-6), had doubtfully placed the Bethylids among the Proctotrupidae, pointing out that Haliday's observation was unconfirmed. Complete confirmation was now forthcoming, not only by Mr. Hamm's record but by many others published in recent years in the Proc. Hawaiian Ent. Soc. The facts there made known by Mr. J. C. Bridwell and others conclusively showed that the habits of these remarkable insects are those of Fossorial Aculeates.

Dr. R. C. L. PERKINS, F.R.S., had very kindly drawn up an abstract of the chief results which have been arranged as in the classification of the species according to their habits adopted by Bridwell, and here quoted in a condensed form on p. xxxi. The years and pages quoted refer to the Proc. Hawaiian Ent. Soc.

(1) *Epyris extraneus* Bridwell.—Francis X. Williams describes this species (1918; pp. 55-63) as stinging a Tenebrionid larva twice her length, carrying the heavy load off on her back, and wedging it between pieces of earth while she finds a suitable nesting-place, the procedure thus resembling that described by Haliday. The life-history of *E. extraneus* is given in great detail and fully illustrated.

Holepyris hawaiiensis Ashm., is stated by Bridwell (1919, p. 311) to sting small Lepidopterous larvae.

(2) *Perisierola emigrata* Rohwer, and *Sierola* sp. attack various Lepidopterous larvae in pods of *Acacia* (Bridwell: 1918, pp. 21 *et seq.*), the former species stinging in three places ventrally—throat, middle and anal extremity—ovipositing (usually 2–8 eggs) an hour or two later. In captivity *Perisierola* attacked almost any larva supplied, sometimes ovipositing, but sucking the juices of beetle larvae. The 5–7 larvae of *Sierola* will completely destroy a caterpillar of *Cryptophlebia vulpes* Wlsm.

(3) *Sclerodermus immigrans* Bridwell.—A captured female attacked (1918, pp. 21 *et seq.*) a Bruchid larva (*Caryolorus*) with its mandibles, and fed on juices. Two days later and subsequently she laid eggs on the larva. The use of the prey as food for both Bethyid and its offspring may throw light on Mr. Hamm's observation.

In a later paper (1919, pp. 291–305) Bridwell described the life-history of this species in great detail. The natural prey observed consisted of beetle larvae of six species—one a Bruchid, two Bostrichids, and three Cerambycids. The Bethyid was bred [in captivity as Dr. Perkins states] on these and many other beetle larvae, the larvae of bees of the genus *Nesoprotopis*, larvae of Fossors, ants, Bracons and Chalcids, also on a Termite.

More than one female was found in the field associated with a single host larva. They "lived in harmony on the paralyzed prey, oviposited, and the progeny of the different females reached maturity without interference from the others."

"This tolerance extended even to the grubs of other species of *Sclerodermus*."

S. immigrans is an immigrant from the Philippines (1919, p. 305), but several endemic (viz. Hawaiian) species of *Sclerodermus* were obtained from various Microlepidopterous larvae feeding in dead wood and some from beetle larvae.

Cephalonomia sp.—Three females from cocoons found by Bridwell (1919, pp. 305–309) in the tunnels of the Scolytid

larva *Hypothenemus* were used for breeding, being placed in tubes with short pieces of twig containing the beetle larvae. In one tube, after three or four days, two larvae bore each a single egg on the ventral surface and in two weeks a female *Cephalonomia* was bred out. Later examination of the same tube revealed beetle larvae bearing one to two eggs or larvae, and a fair proportion of these spun cocoons.

One of the remaining Bethyloid females died without oviposition and the other was less fruitful than that described above.

When pressed for food the parent *Cephalonomia* will itself feed on the juices of the prey, also on the pupal and adult beetle.

Using fine glass tubes rather larger than the burrow and adding debris from the burrows, Bridwell was able to see that the *Cephalonomia*, when she encountered a larva, stung it in the head, and a pupa in the tail. In a few minutes the six larvae and pupae were paralyzed but no eggs had been laid in two days.

After about twenty adults had been reared the colony died out, owing to the difficulty in finding minute beetle larvae.

In the course of the investigation it was found that *Cephalonomia* would oviposit on other minute beetle larvae as well as on *Hypothenemus*.

Bridwell considers that *Cephalonomia* resembles *Sclerodermus* in its habits.

Cephalonomia gallicola Ashm.—This species attacked but did not oviposit on beetle larvae in imported Californian barley on which the Bethyloid was found.

The habits of the Bethyloidea are thus classified by Bridwell :

(1) The *Epyris* group with the adult markedly fossorial in habits, feeding on sweets as well as juices of prey, and laying a single egg on each host.

(2) The *Goniozus* group attacking concealed Lepidopterous larvae and laying several eggs upon them without moving them. *Goniozus*, *Perisierola* and *Sierola* are known to attack thus, and *Laelius* apparently belongs here.

(3) The *Sclerodermus* group in which adults feed exclusively on juices of prey which they attack in hiding and do not move. Several eggs may be laid on the prey.

Dr. Perkins, referring to these fine observations, had written with natural gratification :—

"It is remarkable that the biology of Bethyridae should have been so much elucidated in little Hawaii, with its meagre fauna! The biological work on the allied Dryinidae was also published there, being the result of observations of Hawaiian entomologists. So also that on the *Pipunculus* flies and on the Stylopidae. There is no doubt that Hawaii can congratulate itself on the work of its band of entomologists!"

Fellows of the Entomological Society would also wish to add their congratulations.

MR. A. LOVERIDGE'S NOTES ON THE DRIVER-ANT *DORYLUS NIGRICANS* ILLIG., AT KILOSA, TANGANYIKA TERRITORY.—Prof. POULTON gave an account of the following notes and exhibited the specimens referred to by the author. In the determination of the species he had received the kind help of Dr. G. A. K. Marshall and Mr. W. C. Crawley. A few additional facts recorded below were quoted from letters written between July 11, 1921, and March 1, 1922.

"Kilosa is now spelt with one 's'—Roy. Geogr. Soc. ruling." It was spelt "Kilossa" in Proc. Ent. Soc., 1921, pp. lxii, xci.

The "Marmalade Ant" (*Camponotus maculatus* F.) was described as "harassed by Driver-Ants," the "Cocktail Ant" (*Cremastogaster castanea* Sm., r. *tricolor* Gerst.) and the "Small Ant" (*Pheidole* sp.) as "left in peace." The "Lesser Stink-Ant"—"a match for the Driver-Ants,"—was so called "as we have an outsize in these creatures here."

The "Green Bug," *Platycantha lutea* Westw., "which came to light in great numbers during the rains, was comparatively scarce at the time of the invasion, but was eaten by the Drivers." The "Brown Bug," *Nezara chloris* Westw., also eaten, "began coming to light in great numbers during the rains."

From a later letter—"I have only recently read Carpenter's notes on the Uganda Driver-Ants [Proc. Ent. Soc., 1914, p. cix] in which he says that they approached but retreated from a bug, and he suggests that the peculiar odour of the bug may have protected it. The reverse happened here, Drivers swarming to the spot where a bug was and the whole house reeking of the smell."

*Account of an Invasion of "Siafu" or Red Driver-Ants—
Dorylus (Anomma) nigricans Illig., by Arthur Loveridge.*

Kilosa,
Tang. Territ.,
July 3, 1921.

At 8 a.m. I discovered we were being invaded by Siafu, who were entering the stonework base of the house at half-a-dozen different points, and were already up the door plinth and under the roof at one spot. Beetles, whose presence we were unaware of before, were flying in numbers before the advancing host, frequently with one or more of the red furies attached to their hind legs. Wretched crickets and small grasshoppers were being dragged off, feebly waving the one or two legs that remained to them. The "Marmalade Ants," [*Camponotus maculatus* F., ? race], such a pest in the safe, were driven from their hiding-place and sought refuge amongst books and papers on the table, thereby hoping to evade the flanking scouts seeking hither and thither along the lines of march for fresh supplies for the columns. My pet jumping spiders cleared for their lives with prodigious leaps; one black Carabid beetle clung to the table-cloth whilst a column of invaders streamed past within six inches of him, yet found him not. As is well known, these Driver-Ants, being blind, find their prey by scent.

Soldier-sentries were stationed at intervals of two inches along the lines of the column, waiting with fore-part of the body raised and widely-open jaws for any disturbers. A match-stick being presented to three of these in turn, they readily seized it and were transported eighteen inches away from a hole into which a stream was disappearing. They ran hither and thither and could not find their friends for some time; the first succeeded in doing so after an interval of three minutes, a second following his tracks a little later.

The holes into which they were entering and from which they were issuing formed a regular warren owned and occupied by an inch-long black ant which I have christened the "Lesser Stink-Ant" [*Paltothyreus tarsatus* F.]. From time to time one of these would hurry from an exit as if puzzled and bewildered, and then bolt down another hole. Several of them were attacked by workers of the Siafu, but they readily rid

themselves of one such aggressor: their body was curled under—but I could see no sting—and their jaws came into play with great rapidity. Three Siafu were about a match for one Stink-Ant and I watched one such struggle through a high-power glass. Generally speaking, the Siafu, which were attacking every other creature I could see, left the Stink-Ants alone.

In the afternoon I witnessed an interesting sight. Two holes, one leading into the wall, the other into the ground, had a common opening. Siafu were streaming into the wall, and had a strong barrier or cordon of soldiers thrown across the aperture of the second hole. I was just in time to see a Stink-Ant come from the interior of this second hole very softly, seize a soldier by his jaws and, hauling him from his comrades, drag him into the hole. I settled down to watch and saw this little passage of arms occur a number of times. The way the Stink-Ant would appear and disappear, lurking in the entrance, was very sinister: then, approaching the wall of Siafu gently, he would pause; the soldiery would quiver with excitement and reach forward toward him, but discipline or good sense forbade them to break their line. Suddenly one would be seized, although occasionally the Stink-Ant would fail, and if several soldiers caught him, as happened twice, another Stink-Ant would come to the rescue and a mêlée would follow in which the line would get broken.

All around the walls of the house are many of the inverted cone-shaped pits of the Ant-lions, and it was a common thing for the Siafu workers to tumble into these and be caught. I wondered what the Ant-lion could do against the more formidable soldier Siafu, and so dropped five of them into five pits. The question was obviously incorrect and should have been "What could the Siafu do?"

The soldier would be seized by the Ant-lion by one of the middle pair of legs, and, struggle as he might, he could get no purchase on the shifting sand. There was nothing else for him to do but struggle, nothing of the unseen foe to attack, nothing but shifting sand for his formidable jaws to bite. As he weakened the abdomen was drawn down, and in one instance I saw it nipped by the jaws of the Ant-lion, which

then released the soldier, leaving him quite limp and I fancied at first poisoned, though knowing no instance of Neuropterous insects secreting poison. However, the other four soldiers struggled till the last vestige of their champing jaws disappeared from view in the sand-pit. What a wretched death for the Siafu, worse than being engulfed in a quagmire, but not worse than those of the thousands of small insects which were even now being torn from their retreats in crack and cranny by the moving host.

I presently observed a second species of ant, hereinafter called the "Cocktail" [*Cremastogaster castanea* Sm., r. *tricolor* Gerst.], which was also immune from attack by the Siafu. These Cocktail ants have long dwelt in a corner of the verandah, and at first greatly plagued me by eating insects left on the table or setting-boards, until I found how to turn them to good account as the preparers of bat and rodent skulls—work which they do delicately and beautifully in forty-eight hours when the skulls are small. These Cocktails have regular runs and never invade the inner rooms, so setting-boards were kept in an inner room and there was no more trouble. The Cocktails ran about where the Siafu were, but when baits were laid down the Siafu did not feed at the bait used by Cocktails nor the Cocktails at that eaten by the Siafu. *En passant*, I might say that the Cocktails differ from the Siafu in that they like jam, sugar and sweet-stuffs generally, while the Siafu are out for blood and fresh meat only. Some species of Cocktails are very fierce, but this species never bites when handled, and the only reason for their not being molested by the Siafu, as far as I can see, is that they are not juicy enough to be worth molesting. Another small ant was also left in peace by the Drivers. [The examples sent were *Pheidole* sp., and among them a single *Tetramorium blochmanni* For., r. *continentis* For.]

Whilst fully appreciating the Siafu as a family friend assisting at a sort of spring-cleaning and ridding my residence of insects of all kinds, I did not desire that they should take up permanent residence should they find it a land of plenty, and I was also in some trepidation as to their attitude towards preserved specimens and entomological collections. There-

fore I stuffed paper soaked in prussic acid into the holes they were entering, swept back the columns into heaps and cremated them with paraffin and grass—a dreadful but natural death, as a grass-fire, many miles in length, was even at that moment sweeping across the plains below, destroying all life that failed to escape in time. In a quarter of an hour of all that ordered host only a few score individuals were visible and these were wandering aimlessly hither and thither. I congratulated myself on having punished them so severely that the survivors would leave such an unhealthy locality.

About 9 p.m., as I was reading, I became gradually conscious of many small noises, making altogether quite a volume of suppressed sound. Some time later on taking up the light and going to my bedroom the reason was obvious. The white-washed walls were a moving mass of Siafu; they swarmed upon the books in the bookcase, over-ran other shelving, chest of drawers, etc. The sound was made by the feet of the countless multitude. Almost every minute some insect fell from the ceiling with several Siafu clinging to it, only to be set upon by the ants which were crossing the floor in lines in every direction. In nine out of ten cases the prey was a brown or green plant-bug [brown = *Nezara chloris* Westw.; green = *Platycantha lutea* Westw.: (Pentatomidae)], which, since the cessation of the rains three weeks ago, has been coming in to the house. They fly with a short buzz like a bee, collide with some object and fall upon their backs, where, on a cement floor, they are more helpless than a tortoise. Till this evening I was quite unaware of the huge numbers of them which had taken refuge in the house, hiding in cracks, under boxes, amongst clothes, etc. When molested they give forth the familiar and powerful odour of bugs, and this instead of repelling seemed to excite the Siafu, which hastened to the spot from all directions. Soon the struggling bug was lost to sight in a heap of Siafu which, having nipped off its legs, would drag it along one of their lines of march. Although the bugs were treated in this way, but few were taken to their holes, and we swept up a hundred or so the following morning. The atmosphere of the room reeked with their defensive (¹) odour.

It was necessary to mark time rapidly or else the ants would soon have swarmed on the feet, and, when once climbed up, it was necessary to run out on to the verandah and pull off the biting fury, for if you paused for just the moment necessary to remove one, half-a-dozen others would have gained a foothold on your slippers. Keeping both feet on the move therefore I procured wash-basin, soap-dish, etc., and placed them beneath the four feet of the bed, which was as yet untouched. These I hurriedly filled with water from the jug, raised the mosquito net and jumped in to accomplish disrobing in some degree of comfort. I was much disturbed by the squeaking of bats (*Chaerophon limbatus*, probably) in the roof, the occasional rush of a rat, and the continual falling of particles of whitewash or grit from the ceiling, dislodged by the myriad ants working along the spaces between the ceiling-boards like so many ferrets searching for rabbits.

July 4.—At daybreak the Siafu were still on the move, though those on the walls had all descended and were forming up into regular moving lines on the floor. Finding that fire affected but a small number, the rest escaping quickly, my boys and I swept up the columns and dropped shovelful after shovelful into two basins of water with the surface oiled by a film of paraffin. This killed them more rapidly than anything, and in a minute or two they would cease to struggle. After an hour-and-a-half's hard work scarce a Siafu was to be seen.

Towards sunset (6 p.m.) small lines issued from a hole at the base of the wall (outside) and entered another hole; a second line was going in the reverse direction. Neither company bore any spoils, and their procedure seemed aimless and foolish unless, indeed, we suppose it was a practice route march for two companies to pass through each other without confusion. I have noticed this with Siafu many scores of times.

At 8 p.m. a living stream, six or eight ants wide, was going straight up the verandah wall, and into, or rather beneath, the roof, and, next day, their track was visible as a brown streak on the wall.

At 10 p.m., on entering my bedroom, I was met with the

same sight and smell as on the previous evening. I was just about to get into bed when a few Siafu on the net caused me to climb on a chair from whence I could inspect the top of the net and the sight of a couple of hundred Drivers there (which I then imagined had fallen from the ceiling, as the bed-feet had been left standing in basins of water) caused me to modify my arrangements. Accordingly I took up my pillows and blankets and sought refuge in an unoccupied building some three hundred yards away, where I fared little better than at home, as I was awakened at 2 a.m. and pestered by fleas till daybreak at 6 a.m.

July 5.—Returning home, the boys assisted us to carry on similar operations of wholesale destruction as on the preceding day with the additional precaution of putting down hot ashes at their holes. By 9 a.m. they had all retired. The columns had commenced to move again just before dusk; I think it was shortly after 5 p.m. when I first observed them.

At dusk therefore I laid down ten baits consisting of large lumps of eagle flesh. At 10 p.m. I visited these, and five, which were quite hidden beneath a host of Siafu, I picked up hurriedly with a pair of entomological forceps and dropped into a basin of water filmed as on the preceding day with oil. We thus destroyed several thousand in a few minutes with the greatest ease.

I then retired to bed, having had a new mosquito net put up with a much finer mesh in case any of the ants should fall from the ceiling. Despite the fact that the walls and floor were a crawling mass of live ants, I slept in confident security until 2.30 a.m., when I was awakened by the splashing of a crocodile in its pan. Most of my creatures I had moved outside the previous day, but thought that the young crocodiles in their tank could defy Siafu; the tortoises had also been left in their pen, as it was outside, though against the house. Heroically I decided to rise and go to the rescue despite the ants on the floor. Untucking the net, therefore I stretched forth a hand to turn up the lamp, and encountered an ant on the handle; then I saw a few ants on my pillow and beheld two single lines moving up the net, one inside and the other outside the net. By turning up the mattress and

giving the net a more generous tuck-in I stopped the inside stream; then jumping up I got out on to my slippers, around which ants were swarming. First I examined the pans of water in which the bed-legs were standing: across one of these at the head of the bed a company of sappers had thrown a bridge composed of living ants upon which their comrades were crossing and so up the net. Unscrewing the cap of the lamp container I hurriedly splashed out enough oil on the bridge to cause its collapse, and also to form a film of oil on the water beneath, in which many a gallant Horatius Siafu-soldier lost his life.

The other pans being similarly treated to an accompaniment of rapidly moving feet, as if I were smitten with St. Vitus's Dance, I went out to the crocodiles' cage. One poor beast about 15 inches in length was revolving round and round in the water, belly and back being alternately uppermost, while all the time he threshed the water with his tail in an effort to rid himself of his inexorable assailants. The edges of the rectangular pan (2 ft. \times 1 ft. 6 in.) were lined several deep with a throng of onlookers, which hurled themselves upon the croc. whenever his struggles brought him near the side. Pulling up the glass door and getting a shower of Siafu on my arm in so doing, I pulled the croc. out by his tail and threw him ten feet away, where unfortunately there was a very big swarm of ants. Running to the spot I tossed him outside another ten feet or so; here we were free from ants, and I leisurely picked him up with a pair of forceps and dropped him into the drinking-pan in a case containing half-a-dozen Puff Adders. In the morning he had freed himself of all his foes save one Siafu on either eyelid; these I picked off with a forceps and got bitten in thanks. He felt very seedy for a day or two, but survived his ordeal.

Returning to the house I looked for the other crocodile; but it had sought refuge beneath the hay, and as there was no motion or struggle going on I correctly concluded that it was dead. I had had it for more than four months. The tortoises were making such a commotion in their enclosure that I started in that direction, giving the bushes a wide berth as nearly every leaf was crawling with ants; the

ground was, of course, teeming with them. One heap of ants being particularly dense, I turned it over and found they had killed a chameleon (*C. d. dilepis*), which had doubtless fallen from the bush, beneath which it now lay. Nothing but bones were left in the morning; the ground that lay between me and the tortoises was so alive with Siafu that I very regretfully turned back. Many of the tortoises would be under their rockeries, from which it would be impossible to get so many of them in a hurry.

Once more, therefore, I sought the shelter of my mosquito net, cast the blankets which might be harbouring foes into one corner, killed a few ants on the pillows, and then sat upon these in the centre of the bed and reviewed the situation. The enemy column that had entered the net was wandering to and fro on the ceiling of it, whilst a score or more of individuals were frantically rushing about on the sheet or sides of the net. Armed with my entomological forceps I picked these off one by one, killing them as I did so. The column on the ceiling of the net was similarly disposed of—a hundred or so. On the outside of the net there were still approximately two hundred which had been cut off from retreat by the collapse of the bridge. These I dislodged by striking the net sharply on the inside so that most of them fell to the floor: some clung on, however, and to my disgust the workers made their way through the mesh of the net—I killed one in the very act of struggling through, and half-a-dozen that had already done so. The big-jawed soldiers stayed without. I killed the others, one by one, as they got in till I was left in comparative peace, speculating whether the Psalmist had a visitation of Siafu in mind when he referred to “the terror by night.”

My own immediate troubles being ended I listened to the sounds in the roof, which were easy of interpretation. A rat, attacked, ran for its life, then paused to rid itself of its aggressors, but the pause only gave opportunity for reinforcements of the foe; with a frightened squeak it ran on, escaped to the outer roof, where it lost its foothold on the galvanised iron, and rolled down, landing with a thump on the ground outside; presumably it escaped, for morning revealed no heap of bones

or mass of ants at the spot. Not so fortunate were the nestling rats—at least, so I judged them to be by a series of small squeaks which gradually grew fainter. It made one shudder to think of the awful death scores of small creatures were dying. The bats had left on the first day, though I found one dead clinging to the mosquito gauze of the window. Perhaps it died of fright, for, had the ants attacked it, they would not have left one bone uncleaned. Several geckos (*Hemidactylus mabouia*) gave the ants a good run; some were killed, some escaped and were running about next day as if nothing had happened.

July 6.—From 2.30 a.m. to 5.30 a.m., therefore, I lay awake, sleep being out of the question. At 5.30 I called the boys that we might harass the ants before they gained cover in their holes at daybreak. We first collected the ten meat-baits—each a mass of ants. It is difficult for one who has never seen Siafu to conceive of the way in which they pile themselves, one upon another. When the baits had been dropped into the basins we fired the hay in the crocodiles' cage, which as already stated was a seething mass of moving ants: the body of the crocodile was recovered, or rather the skin and bones. With handfuls of blazing grass we swept up the lines of ants proceeding to the tortoise enclosure, and then went in to effect their release, continuously moving our feet to frustrate attack.

To my relief all were alive. Bell's Box Tortoises (*Cinnixys belliana*) had practically defied attack, and only one or two Siafu were hanging on to each individual. Their armour-plated fore-legs, when drawn in, protect the head in a most wonderful fashion; they had had such a fright that not one of them extruded its head whilst I was there. The Soft-shelled Land Tortoises (*Testudo loveridgii*), on the other hand, had fared badly. Many had a score of Siafu attached to them, one had its eyelids badly eaten. I dropped all these into a drum of water, and then set a native to work picking off the remaining Siafu with a pair of forceps.

On entering a room where sundry specimens are kept I found it still, at 7 a.m., swarming with Siafu, and from the drying-safe came the rasping of their feet on the gauze mesh.

The previous evening I had taken the special precaution of having raw cotton (kapok) stuffed all round the door to prevent entry to the safe. In spite of this they had got in, but did not seem able to get out. I expected the fifty odd butterflies that were drying would all have perished, but was agreeably surprised to find that only those caught within the past two days had been touched.

These included *Salamis anacardii nebulosa* Trim., *Neptis saclava* Bd., *Euphaedra eleus orientis* Rothsch., *Cymothoe*, and two fine females of *Euzanthe tiberius* Gr.-Sm., and *Papilio dardanus* Brown, ♀ f. *lamborni* Poul., respectively. The bodies and antennae only were eaten.* The only others injured were a mantis and the head of another mantis that had been captured a week before but was not yet dry.

Some fifty bird-skins taken during the previous week were untouched, but one, which the native skinner had insufficiently poisoned on June 26, appeared to be attacked. This was a Guinea Fowl (*N. mitrata*), but, after the swarming ants had been shaken off it, I found that they had not touched the skin but were removing some maggots from the wings. Some 500 skins were in boxes which were not ant-proof, and these had not been molested at all.

Later in the day I saw a pleasing sequel to the affray between the Lesser Stink-Ants and Siafu; beneath the doorstep at the opposite end of the house from that where the affray had taken place, a little heap of dirt and Siafu heads caught my eye. I therefore watched the entrance to the hole outside which it had accumulated, and presently a Stink-Ant came to the opening and dropped a Siafu head, presently another came with a bit of grit, then one with another head and so on. I took the liberty of removing this dump and found that it was only the Siafu soldiers that had been beheaded; the

* The remains of the above butterflies, except the *Cymothoe* and *Euzanthe*, were received—also the Hesperid *Tagiades flexus* F., referred to as eaten by the Siafu in a letter of 11. vii. 21. All bore the date 4. vii. 21. Both antennae of the *Salamis* and *Euphaedra* were present and one of the *Neptis*. The shrivelled eyes probably showed that the heads had been eaten out. The thorax (the only part of the body) of *Tagiades*, but not of the three with heads, appeared to be empty. The *Papilio dardanus* (left wings only) extended the range of the female f. *lamborni* over 100 miles southward (Trans. Ent. Soc. Lond., 1917, p. 333).—E.B.P.

workers' bodies were intact. I counted out a hundred corpses and estimated the remainder at seven hundred, which represented one day-and-night's work, as the Siafu had not reached the western end of the house forty-eight hours ago. Bravo the Stink-Ants! A society should be formed without delay for the "Preservation of the Stink-Ant in our East African Protectorates." At present their sole protection from evilly-disposed persons is the bad odour emanating from a trodden-on ant.

We were fully prepared for the 5 p.m. parade, and, as soon as it was going sufficiently strong, annihilated the line all along the wall with hot ashes, causing complete desertion of that track. On their issuing from a hole on the verandah floor, a charge of cyanide powder was put in and hot ashes heaped over it. Ashes and meat-bait were used freely between 8 and 11 p.m. whenever any ants appeared. Columns were smothered in cold ashes, although this is somewhat of a failure unless it is heaped too high for them to surmount; for though they will generally desert an ash-strewn track, they will nevertheless walk a clean path through the ashes if they very much wish to proceed that way.

July 7.—During the night the meat-baits were untouched in all rooms save one, where some three or four thousand were destroyed on the single bait. Whether my efforts had had anything to do with their desertion of the other rooms is open to doubt, as they had consistently worked through the house from east to west, taking the five rooms with their respective ceilings in order, except the enclosed verandah (on to which all rooms led) which they visited every night.

Whilst the interior of the house was refreshingly free from the foe, the immediate surroundings were little short of horrifying. On the north and west only a few thousand ants, perhaps 20,000, were entering their holes in the base of the house-wall. These belonged to the original force that arrived four days before. Within five feet of the house on the east (my attention being first attracted by the smell of dying bugs), thousands were on a Sisal (*Aloe*) plant, which harbours many creatures round its spear-protected base, and these refugees were now being murdered wholesale. We

heaped grass around and fired it. The sound of sizzling Siafu no longer moves me, and I can look upon a dying soldier ant with perfect equanimity.

Then came the shock. In every direction from east and south ants were arriving in countless thousands; they travel a great deal underground, passing from one hole over a couple of yards of surface and then down another hole, each entrance guarded by a massed ring of soldiers. Quite thirty of these steady streams were moving in the direction of the house.

We fired the grass extensively wherever they happened to be passing through it, heaped dried grass on all exposed lines and set fire to it, so that they all hastened below ground.

At 10 p.m. I searched the house but could not find a single Siafu, but whilst standing on the extreme east end of the verandah I could hear thousands of them in some dry grass thirty feet away. Taking an acetylene lamp I examined the broad path, but there were no visible tracks across it such as they usually leave, and I am convinced that they had reached their present position entirely by underground runs. As for the grass and bush, every blade and leaf was being systematically searched for prey; presumably the united forces of all the Siafu were in this tinder-dry vegetation. My enemy now lay entirely at my mercy, but, as it is easier to light a fire in Africa than to put it out, I had to let them go; for the belt of dry bush extended right away to some dry standing crops two miles off, and though there was no wind one might spring up at any minute.

One of the most striking things was the entire absence of Siafu from the house; not a single company had come for the abundant meat-baits which had been left for them; the discipline and organisation of the army were beyond reproach.

The effect of the search in the grass was to send a large number of plant-bugs flying to the light, so I am inclined to doubt whether the house was very much freer of them after a couple of days than it was before their visit. Geckos returned to their accustomed haunts, and their numbers do not seem to have suffered appreciably. I heard one or two bats in the roof reconnoitring, but do not know whether they have yet returned to roost.

July 8.—The Cocktail ants [*Cremastogaster castanea*, r. *tricolor*] have been unusually active the last three days and their numbers seem to have received reinforcements. Instead of solitary individuals going to the safe there is a regular procession coming and going as if they had learnt something from the Siafu.

Termites came up through the floor in an old place. I was hoping that they would have been wiped out by the Siafu, as the latter must have been in extensive occupation of their passages. I think that the effect of the invasion has been to keep them quiescent.

Summary.

Whilst Siafu undoubtedly do a lot of good in a house by ridding one of unwelcome insects, at the same time they drive off other insectivorous creatures—bats, geckos, jumping spiders, etc. If they continue to operate in the neighbourhood they may undo the good accomplished, by driving in fresh hosts of insects. Apart from this they might aptly be compared to a purging fire which without discrimination destroys foe and friend, and is on the whole too dangerous a remedy to call in.

The best method to combat them is to lay down hot ashes around the building before they enter, provided that there are no underground tunnels leading into the house, which, however, is generally the case in the tropics. Meat-baits undoubtedly destroy incredible numbers. The baits should be taken up every few hours and dropped into a bucket or basin containing water with a film of paraffin on the surface.

If water only is used many will crawl out, and apparently drowned ants, left in for twelve hours, will come round in another twenty-four.

Paraffin poured on a cement floor kills all that happen to be covered by it, but in an hour or two it will have sufficiently evaporated for them to recommence their peregrinations over the spot so treated.

A formalin solution (6 % was used) poured on a column passing along the base of a wall threw them into great confusion

and killed a few, but had no lasting effect, for they returned in a few hours.

I have been informed that sheep dip is most efficacious in keeping the Siafu away from a house.

EARLY STAGES OF *OSMYLUS CHRYSOPS*.—Mr. C. L. WITHERCOMBE brought for exhibition a larva and adult of *Osmylus chrysops* L., with some enlarged photographs illustrating them, and made the following comments.

"Several larvae of this Neuropteran were taken a few weeks ago, at Sevenoaks, in moss on the margins of a small stream. They are amphibious in habits, living in wet situations and feeding mainly on Dipterous larvae. They are rather sluggish, but can walk quite rapidly. The mouth-parts are remarkable, being much elongated and almost straight. Each mandible is grooved internally, and against this the maxilla is pressed to form a sucking tube. The main difference of these sucking spears from those of most other Neuroptera is that these sucking spears are curved slightly outwards instead of being caliper-shaped, and consequently cannot seize and hold a struggling insect. A small Chironomid larva ($\frac{1}{4}$ inch long) was offered to one specimen, which at once became very active and stabbed viciously downwards with its spears several times. After some misses it succeeded in piercing the Chironomid, and within fifteen seconds the latter, which had previously been very active, ceased to show any signs of life, although no appreciable amount of its blood had been extracted. It is therefore to be supposed that some very poisonous salivary fluid had been secreted by the *Osmylus*.

"A closely woven pale yellow cocoon is spun for pupation, of silk secreted from the anus."

Larvae of *Taeniorhynchus richiardii* Ficalbi, taken in Epping Forest on roots of *Typha ensifolia* in December 1921, were also exhibited.

The larva of this Culicid has the siphon modified for piercing the roots of aquatic plants from which it obtains its air supply.

A normal Culicine larva (*Finlaya geniculata*) was also shown for comparison, with a series of photographs showing the larva attached to aquatic roots and one illustrating the method of penetrating a root.

Papers.

The following papers were read:—

"The Mallophaga of the Oxford University Expedition to Spitsbergen," by Dr. J. WATERSTON, D.Sc., B.D.

"The Dasytinae of South Africa," by Mr. G. C. CHAMPION, F.Z.S., A.L.S.

"A Monograph of the genus *Catochrysops*," by Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

"The Species of the Genus *Larinopoda*," by Dr. H. ELTRINGHAM, M.A., D.Sc., F.Z.S.

Wednesday, June 7th, 1922.

The Rt. Hon. Lord ROTHSCHILD, F.R.S., President, in the Chair.

Obituary.

The PRESIDENT announced the death of Mr. H. ROWLAND-BROWN, M.A., formerly Secretary of the Society, and a vote of condolence with his relatives was passed.

New Member of Council.

The PRESIDENT announced that Mr. H. WILLOUGHBY ELLIS, F.Z.S., had been co-opted on the Council in the place of the late Mr. ROWLAND-BROWN.

Election of Fellows.

The following were elected Fellows of the Society:—
Messrs. B. A. R. GATER, B.A., F.R.M.S., 13, Arundel Mansions, Kelvedon Road, S.W. 6; LIONEL LACEY, Churchfield, Rodborough, Stroud, Glos.; HERBERT MACE, Faircotes, Harlow, Essex; WILLIAM H. JACKSON, 14, Woodcote Valley Road, Purley; and Miss A. B. FLOWER, Eastbury, Surrey Road, Bournemouth West.

Exhibitions.

TRANSFORMATIONAL DECEPTIVE RESEMBLANCE IN INSECTS.
—Prof. POULTON, referring to Mr. Uvarov's extremely interesting paper on the transition from Mimetic to Protective

Resemblance in certain Long-horned Grasshoppers (Trans. Ent. Soc., 1922, p. 269), said that the word "Transformational" expressed the author's meaning better than "Transformative"—the word actually used; inasmuch as the latter implied something preparatory or leading up to transformation rather than transformation itself. Such transitions have been known for a long time in those Mantidae which are at first ant-like and later on come to resemble leaves, etc.; also in ant-like and Sawfly-larva-like caterpillars becoming procryptic when older, such as *Stauropus fagi* and *Endromis versicolor*, and in caterpillars bearing terrifying eye-spots suggesting a Cobra-like snake, yet developing into well-concealed moths. Such well-known examples lead to the conclusion that the passage from Mimicry to Protective Resemblance in a single life-history was by no means uncommon.

H. W. Bates in his classical memoir on Mimicry did not separate these two categories, but, although they had much in common, it was inconvenient to treat them as one. By Mimicry an animal resembled another with Warning Colours, and in resembling it, became conspicuous (in Müllerian Mimicry better known by adopting Warning Colours in common with others in place of an independent advertisement), appearing to be something well known and disliked by its enemies: by Protective Resemblance an animal became concealed, appearing to be something passed by as of no interest to its enemies. The two categories had been grouped together as "Apatetic Resemblance" (with the substantive form "Apaté"), from ἀπατητικός deceitful, and defined as follows:—"Colours [including shape and attitude] which cause an animal to resemble some part of its usual environment, or which cause it to be mistaken for an animal of another species." *

Now that attention had been directed to these interesting examples of passage by a single individual from one category to the other, it was convenient to modify the terminology in order to include them. With the kind help of Prof.

* "Colours of Animals," Poulton, Internat. Sci. Ser., London, 1890, Table following p. 339.

A. C. Clark the terms "Metamorph-apatetic Resemblance" and "Metamorphic Apaté" were now suggested as the technical equivalents of "Transformational Deceptive Resemblance." Just as "Metamorphosis" had been long used to express a well-known transformation of form and structure becoming visible at a change of skin, so here the same word was adopted to express a transformation with a special significance, also apparent at a change of skin.

COCCINELLA SEPTEMPUNCTATA L., AS THE PREY OF THE ASILID FLY LAPHRIA FLAVA L.—Prof. POULTON exhibited a female *Laphria flava* with its Coccinellid prey captured by Dr. Karl Jordan in the Harz Mountains, between Goslar and Hahnenklee (July, 1921),—one of many seen by him devouring the same species, at the time particularly common and conspicuous. A male *Laphria flava* with Ichneumonid prey—a male *Meniscus impressor* Gray (*Lissonotus* group of Pimplinae)—captured by Dr. Jordan at the same time was also exhibited.

These constant attacks on a conspicuous Coccinellid were an interesting addition to the evidence that Asilidae are some of the principal enemies of specially protected insects.

Kind help in the determinations had been given by Mr. G. J. Arrow, Major Austen, Mr. J. E. Collin and Mr. R. E. Turner.

RECENT OBSERVATIONS ON THE "FALSE HEAD" OF LYCAENIDAE IN RELATION TO THE ATTACKS OF ENEMIES.—Prof. POULTON called attention to Dr. V. G. L. Van Someren's interesting observations recorded in Journ. E. Afr. and Uganda Nat. Hist. Soc., No. 17, Mar. 1922, p. 18. The appearance of a "false head" at the anal angle of the hind-wing of Lycaenidae had been recognised not by "one authority," as the author supposed, but by many, and independently of each other. A list up to 1906 is recorded in Proc. Ent. Soc. for that year (p. lii); and to this must be added T. R. Bell in Ent. Mo. Mag., 1906, p. 128, and J. Sibree in "Naturalist in Madagascar" (London, 1915, p. 254), quoted in Proc. Ent. Soc., 1917, p. lxxv. And later still there are the important observations of Dr. Th. Mortensen in Taboga Island, Panama (abstract and reference in Proc.

Ent. Soc., 1918, p. xliv; see also Proc., 1919, p. xi). It is improbable that all the naturalists mentioned in the pages referred to were mistaken in the conclusion they arrived at independently. Furthermore, a lizard has been seen to be obviously attracted by the eye-spot near the apex of the fore-wing under surface of *Coenonympha pamphilus* L. ("Colours of Animals," London, 1890, pp. 206, 207; see also Trans. Ent. Soc., 1902, pp. 440, 441.)

Dr. Van Someren was inclined to reject the theory of the "false head" in favour of one which assumes simple conspicuousness and attractiveness in the colours and structures at the anal angle of the hind-wing under surface. This latter explanation has already been suggested for numerous Lycaenidae with tails "too large and conspicuous to resemble antennae"—species in which "the appearance of a 'false head' seems to have been to a large extent lost in the promotion of excessive conspicuousness" (Proc. 1918, p. xlviii).

In other Lycaenidae, however, the fine hair-like tails made to pass and repass each other by the eccentric movements, the associated eye-spots, and the outwardly bent lobe of many species, giving, as Dr. Mortensen wrote, "the most wonderful likeness to a real broad head," have, without doubt, been correctly interpreted as a head-like appearance, rendering a non-vital part especially attractive to vertebrate enemies. The difference between this and Van Someren's view is not great, for he also considers this part of the wing to be an area "of most attractability," although not head-like. The divergence is perhaps to be explained by the fact that he observed in the field and figured, in the plate facing p. 18 of his paper, many species with the "excessive conspicuousness" referred to above.

The existence of two or more eye-spots and tails in so many species, also well illustrated in Van Someren's plate, has for long been a puzzle, now for the first time explained by the author's observation that lizards, invariably approaching from behind, attacked sometimes from above, seizing the upper eye-spot and tail, sometimes from below, seizing the lower, sometimes directly from behind, removing part of both eye-spots. Attacks from all three directions were con-

vincingly illustrated on p. 20 of his paper. Another advantage appears to follow from the author's observation of repeated attacks on the same butterfly, viz. the existence of a second eye-spot and tail to direct a later attack when the first have been removed by an earlier one.

Lycaenidae that have been presumably seized by an enemy are often found to be more extensively injured on one side than the other, and this the author explains by an attack from behind and one side upon a butterfly with partially opened wings.

[Since the meeting on June 7, the specimens represented on his plate have been kindly forwarded by Dr. Van Someren. Prof. Poulton hoped to exhibit them to the Society at an early meeting in the autumn session. July 5, 1922.]

SYMMETRICAL INJURIES TO THE WINGS OF A BUTTERFLY BRED IN CONFINEMENT.—Prof. POULTON exhibited a specimen of *Papilio machaon* L., bred at the Zoological Museum, Tring, May 22, 1922, from one of many pupae collected by Mr. J. Foster at Ranworth near Norwich. A symmetrical notch, like that produced by a bird's beak, had removed half the anal eye-spot of both hind-wings. The injury was probably inflicted upon the closed wings, when soft, by one of the other butterflies crowded in the breeding cage, perhaps by the hard costal margin of the fore-wing, and it was unlikely that such a cause would operate commonly in nature.

Prof. POULTON also exhibited an example of *Heodes phlaeas* L., with an unusually severe injury to all four wings. The butterfly had been taken, June 4, 1922, at Hogley Bog, Oxford, by Mr. A. H. Hamm, who observed the injury before effecting the capture. It was probable that the insect, at rest with wings upright, had been attacked, from behind and the left side, by a bird whose bill had cut a deep notch passing upwards through the anterior half of the hind-wings and invading with its apex the inner margin of the fore-wings.

THE ETHIOPIAN RACES OF HEODES PHLAEAS L.—Prof. POULTON said that, since his communication of October 15 last year (Proceedings, p. lxxxi), he had been afforded the opportunity of studying an Abyssinian series in the British

Museum collection, and three specimens forming the type material of *H. pseudophlacis* Lucas (1866) in the Paris Museum, kindly sent by M. le Cerf; also the complete series of *H. phlaeis ethiopica* Poult., kindly lent by Mr. J. J. Joisey.

H. phlaeis pseudophlacis.—The Paris material included two males and one female. The only locality was "Abyssinia" on one male. The specimens are in good condition, but, compared with the more recent examples in the British Museum, are distinctly paler, a result probably due at least in part to fading.

The British Museum series, evidently of the same race as the above, consists of 6 males and 8 females with the following data :—

1902. Harrer ("Degen" on one example, "N. Degen" on the other): January 3—2 ♀.

1904. Managasha (these and the remaining Abyssinian specimens captured by Ph. C. Zaphiro): October 24—1 ♂; October 26—2 ♂.

1905. Charada Forest, Kaffa (6000 ft.): May 21—1 ♂; June 4—1 ♂; June 6—2 ♀; June 9—1 ♂.

1905. Codjeb River, Kaffa: May 26—2 ♀.

1905. Ella Couta (5000 ft.): June 14—1 ♀.

1905. Totcha Kullo (8000 ft.): June 18—1 ♀.

H. phlaeis ethiopica.—The Hill Museum series includes a specimen without locality labelled "Ex. Coll. Suffert 1912: ? *H. abboti*: ? new: O. H. Schwarz"; also the following, all collected by Mr. T. A. Barns in the country to the N. and N.E. of Lake Tanganyika and around Lake Kivu :—

East of the north end of Lake Tanganyika, Urundi District, Upper Ruvubu River: July and August, 1919—1 ♂ 1 ♀.

The same district, Upper Akanjuru Valley (1400 m.): August, 1919—2 ♂ 2 ♀.

North of Lake Tanganyika, Ruanda District, Lake Tshobos: August, 1919—1 ♂.

North of Lake Tanganyika, Lake Kivu, Kissenji: September and October, 1919—2 ♂ 1 ♀.

N.W. Kivu, Lake Mokoto District (5000-7500 ft.): September, 1921—2 ♂.

The data of the 11 specimens taken by Dr. G. D. H.

Carpenter to the north of the above-mentioned localities have already been recorded (Proc., 1921, p. lxxxi).

H. phlaeas ethiopica is therefore, so far as its distribution is known to us, an insect of high ground in and especially along the E. border of the southern section of the Western Rift Valley—the valley containing the Albert Nyanza, Tanganyika, and the lakes that lie between.

Comparison of pseudophlaeas and ethiopica with each other and with H. phlaeas phlaeas L.—These two African geographical races are very closely allied to each other and to *H. phlaeas phlaeas* L. Before comparing them it will be convenient to quote the brief description of *pseudophlaeas* by H. Lucas in Ann. Soc. Ent. Fr., 1865, pp. 499–500, and contained in the following Note (2):—

“Cette variété, par la teinte pâle constante de ses ailes, par l'échancrure du bord terminal qui est à peine marquée et par l'angle anal qui est terminé en une queue assez prolongé, doit former une espèce nouvelle. . . .”

Furthermore it is stated on p. 499 that the Abyssinian examples “sont très-remarquables par la teinte pâle de leurs ailes en dessus et en dessous.”

As regards the under surface this statement is incorrect; for the pale grey ground-colour in a large proportion of the individuals of *phlaeas* is much lighter than the reddish ground of *pseudophlaeas* and further still from the deeper tint of *ethiopica*. There are, of course, dark grey examples of *phlaeas* for which Lucas' comparison would hold.

On both upper and under surfaces *ethiopica* is a darker insect than *pseudophlaeas*. This is true of the black as well as the red. In addition to this general distinction there are certain differences in details, some of which appear to be constant while others only hold for the majority of the known individuals of each race.

Fore-wing Upper Surface.—The black spot near the anal angle, and extending, when well developed, from vein 1 to 2, is inwardly concave (viz. towards the base of the wing), outwardly convex, in all known examples of *ethiopica*, the character being generally strongly although sometimes very slightly marked. In *pseudophlaeas* the outer margin of the

spot is concave or straight, the inner convex or straight. Not one of the specimens resembled *ethiopica* in this respect.

The shape of this spot shows great variation in *phlaeas* of the Northern Belt, but the concavity is more generally outward than inward and therefore more often like *pseudophlaeas* than *ethiopica*. The spot is often rectangular, rhomboidal, or more or less deformed; frequently shows a tendency, generally more strongly marked on the under surface, to become double; sometimes completely splits into two. The form of the spot could probably be shown to vary geographically if sufficient material were available. Thus an interesting form with radiately drawn out F.W. spots, occurring year after year (Strecker) in a limited area in Massachusetts, has the spot double in four out of five examples in the British Museum. Indications of division are also distinct in radiate forms from Maine, and in two out of four of the form *americanus* D'Urban, in the same collection.

Out of eighteen examples collected in the Chusan Islands, E. China, by Commander Walker (11 in British Museum, 7 in Hope Dept.) the great majority have the spot curved inwards as in *ethiopica*; in one it is very large and rhomboidal, in four hourglass-shaped, a distinct indication of its double nature still more clearly expressed on the under surface of these and others of the series.

As regards this character *H. abbotti* is nearer *pseudophlaeas*, 10 out of 48 in the Hope collection having an outwardly curved spot, 6 an inwardly. Generally the spot is long and narrow with straightish sides and often more or less constricted, sometimes actually divided. It is also often relatively small, thus approaching the S. African *H. orus* Cram., in which it is often absent and always small as compared with the rest of the series, although, in spite of this reduction, it is divided in 5 out of the 34 specimens in the Hope Department. The 19 examples of *abbotti* in the British Museum resemble the Oxford series in this character.

The Form of the Hind-wing.—The almost complete disappearance of the "échancrure," or bay between the anal angle, often becoming an anal tail, and the small "tail" commonly present in *phlaeas* (the tail into which vein 2 is

prolonged), is caused by absence of this latter feature in *pseudophlacaeas*. The second tail is also generally wanting in *ethiopica*, although a vestige exists in some few individuals, as also in a few *abboti*. In *phlaeas* this tail is an extremely variable feature, which, strangely enough, is especially strongly developed in many examples from localities near Africa, viz. Asia Minor and Cyprus. The prolongation of the anal angle of the hind-wing, described by Lucas, also occurs, although to a less extent, in *ethiopica* and *abboti*.

The Hind-wing Upper Surface.—The scalloping of the inner border of the marginal band, due to the prolongation of the red inwards along the veins, is more strongly marked in *ethiopica*, although in a single example from Kigezi the border is as plain as in any *pseudophlacaeas*.

The coppery lustre of the black surface within the band is, on the average, more strongly developed in *pseudophlacaeas* which to this extent approaches *abboti* more nearly than *ethiopica*.

The relative degree of development of the well-known inter-nerve blue spots, along the inner border of the marginal band, is perhaps the most interesting difference between *ethiopica* and *pseudophlacaeas*. At first sight, this feature seemed to be entirely wanting from the Abyssinian series, but careful examination with a lens showed that the largest spot was represented by 6 or 7 scales in one male, by 3 or 4 in a second, and the only spot by a single scale in a third. No trace was found in the Paris specimens nor in any Abyssinian female.

Ethiopica, on the contrary, always possessed the feature, generally strongly developed. The single male, formerly supposed to be without it (Proc., 1921, p. lxxxii), was found to possess 5 blue scales in one space on the right side. In the southern examples from the Hill Museum this feature was on the whole more strongly developed than in those from S.W. Uganda, although strongest of all in one of Dr. Carpenter's males from Kigezi.

A study of *phlaeas* would probably show that this character also varies in development in different parts of the Northern Belt.

The Hind-wing Under Surface.—*Ethiopica* is, on the average, of a darker reddish colour than *pseudophaeas* and has darker and more pronounced dusky internervular markings just inside the marginal red band. The more basal dark spots vary greatly in both races, being sometimes distinct, sometimes evanescent in both. In the tint of the under surface *abboti* appears to be somewhat nearer to *pseudophaeas*.

The fine central line of a deeper red which traverses the marginal band and is composed of a curved section, outwardly concave, in each space, is far more distinct in most examples of *ethiopica* than in any of *pseudophaeas*, in which indeed it is generally very indistinct. The band itself is also less strongly marked in *pseudophaeas*—especially so in the two Paris males—thus giving to the under surface a more uniform appearance than that of *ethiopica*.

The Under Surface of the Abdomen.—This surface varies greatly in tint, but it is, on the average, paler in *pseudophaeas*, and, in a larger proportion of individuals, white, than in *ethiopica*.

Comparison between the Northern and Southern ethiopica.—The differences were extremely slight and only recognisable by the study and comparison of the whole series from each area. On the average the red marginal band of the hind-wing was slightly broader in the south, and, on the under surface, the fine central deep red line traversing this band was brighter and more sharply defined. The under surface as a whole was very similar but slightly brighter in the south. There was no perceptible difference in the shade of red in the fore-wing or in the basal iridescence, sometimes spreading over the whole of the black area, in the hind.

PSEUDOPONTIA PARADOXA FELD.; ITS BIONOMICS, GEOGRAPHICAL RACES, AND AFFINITY.—Prof. POULTON said that he had recently received a collection of Lepidoptera made in July 1921 in the Semliki Valley by his friends Mr. C. A. Wiggins, P.M.O. Uganda Prot., and Dr. G. D. H. Carpenter, D.M. The precise locality was the Buamba Forest in that part of the Semliki Valley which lies west of the north end of Ruwenzori and in British territory, viz. Toro, Uganda. The elevation was about 3000 ft. and the position about

30° 5' E. and 0° 45' N. The forest was the extreme eastern edge of the great Congo Forest which stretches westward to the sea, and was of much interest in that it afforded the passage between the typical conditions in that great Sub-region (the 2nd or West African of Wallace) and the open country and scattered forests of Uganda.

A collection made by Dr. S. A. Neave in this locality, November 3-7 (Dry Season), 1911, showed that there was a most interesting transition between some of the West African butterflies and their Uganda races, and it was confidently believed that the locality would well repay further study, especially if undertaken in the Wet Season. The weather on the selected dates—July 21 to 31—was unfortunately too wet and collecting was much hindered by rain and clouds. The expenses were defrayed from a fund for the study of evolution presented to the University of Oxford in Prof. Poulton's name by his friend Prof. James Mark Baldwin.

1. *Pseudopontia* and the *Pierines* associated with it in the *Sentiki Valley*.—The collection contained 39 examples of *Pseudopontia*, while Mr. Wiggins's and Dr. Carpenter's letters told something of its habits and appearance in life.

Bearing in mind the wide differences of opinion concerning this remarkable insect—formerly considered by British entomologists to be a moth, by certain authorities to be altogether outside the Lepidoptera, and by Aurivillius to belong to "the most peculiar of all known genera of butterflies" (Seitz's "*Macrolepidoptera*," xiii, p. 30)—it seemed well to publish these recent observations as soon as possible, together with any further results which might be yielded by the study of the specimens.

Dr. S. A. Neave, Dr. R. J. Tillyard (who, on his visit to this country in 1920, had been persuaded to take material for examination), Dr. F. A. Dixey, F.R.S., and Dr. H. Eltringham have kindly contributed the sections which follow their names, and the results entirely support the conclusions of those naturalists who have maintained that *Pseudopontia* is an aberrant Pierine butterfly.

The following observations recorded in the letters referred

to above, and the collection itself, strongly confirm Dr. Dixey's hypothesis (Proc. Ent. Soc., 1906, pp. lxi, lxx), brought forward many years ago, of mimetic association between *Pseudopontia* and *Nychitona medusa*, as also Dr. Neave's previously published observations (Proc. Ent. Soc., 1908, p. xiii), amplified in his section of this communication.

From Mr. C. A. Wiggins, November 27, 1921.—“*Pseudopontia* [described as common in a letter of July 31] certainly occurred with other Pierines and especially *N. medusa*. The flight is very slow and very like *N. medusa*. I don't think I saw it settled. It was a perfect nuisance in the net as it bent its wings over so, bending them in the middle as I've never seen any other butterfly do, thus—”

The accompanying sketch showed the wings bent over ventrally so far as to be nearly parallel, the bend or false hinge being near the base but separated by a considerable interval from the true hinge.

From Dr. G. D. H. Carpenter, July 30, 1921.—“Pierines also seem scarce. The commonest is *Belenois solivus* Butl., next *Leuceronia thalassina* Boisd., of the large ones, but *Nychitona medusa* Cr., and *Pseudopontia* are fairly abundant. The latter I had not met before, and quite overlooked it (probably not distinguishing it from *medusa*), until I found one in one of the boy's papers and was at once struck by the transparent appearance and curious venation. I have soon learnt to distinguish it from *medusa*, but its manner of flight closely resembles that of the other. It looks, however, much more transparent and slightly green. *Leuceronia pharis* Boisd., and a few *Pinacopteryx* and *Phrissura* also occur.”

November 6, 1921.—“*Pseudopontia* in every way was much like *Nychitona*. It flies with it and settles with wings apposed. I don't think I have found it in position of permanent rest.”

[Received from Dr. Carpenter since the meeting.]

June 10, 1922.—“I do not think that anyone who had often seen *Pseudopontia alive* could have much doubt as to its butterfly nature.”

The table on p. lx, recording all the examples of the three species of this association, contained in the collection, proved

their occurrence and flight together on several days. It is probable, however, that *Nychitona*, with which both naturalists were very familiar, was proportionately commoner than the captures indicate.

The 26 examples of *Nychitona* were somewhat sharply separable into a larger form with an expanse of $1\frac{1}{2}$ to $1\frac{3}{4}$ in., and a smaller form of about $1\frac{1}{4}$ in. Both lacked the spot in the fore-wing. The larger appeared to be a small variety of *N. medusa* f. *immaculata* Auriv., and, from the form of the apical black margin to the fore-wing, five males of the smaller form (taken July 23, 27 and 28) also appeared to be *immaculata*. Judging from the same feature, the two remaining males resembled *N. alcesta* Cr., f. *nuptilla* Auriv., but were smaller, while the two females, entirely without the black apical margin, appeared to belong to them. These females resembled *nupta* Butl., as figured by Aurivillius (Seitz's "Macrolepidoptera," xiii, pl. 106), but were smaller. The two males, coming from the locality of *nuptilla* (Ruwenzori), are almost certainly this form, and the two females may be the same, or the form described by Butler, although here the locality was Angola. Aurivillius, on p. 31 of the above-mentioned work, speaks of *nupta* as entirely white, but Butler (Cist. Ent., Vol. i, p. 175) describes the apical edge of the fore-wing as "slightly dusky," and, this being so, it does not seem to be distinguishable from a pale-edged *nuptilla*. The distinction between *medusa* and *alcesta*, or between any other different species that may be supposed to exist in the varied African forms of *Nychitona*, requires for its establishment a structural or genetic foundation, and, until this is supplied, the extent of variation and transition suggests that they should all be regarded as forms of Cramer's *medusa*.

As regards the mimetic association, the larger forms in the following table would resemble in size the majority of *Pseudopontia*, while the black apical margin, invisible in flight and merely causing the insect to appear somewhat smaller, would not become a distinguishing feature. The smaller forms of *Pseudopontia* would similarly resemble the smaller ones of *Nychitona*.

It should be mentioned that the collection also contained an association of white, black-tipped, day-flying moths grouped round an abundant *Lymantrid* model. This association probably entered into mimetic relationship with that centred by *Nychitona*.

Dates in 1921.	<i>Nychitona medusa</i> .				<i>Leucronis pharis</i> .		<i>Pseudopontia paradoxa</i> .*	
	Larger form.		Smaller form.		Male.	Female.	Male.	Female.
	Male.	Female.	Male.	Female.				
July 21	1		2	1				
" 22	2					1		
" 23	1		1					
" 24	1	1		1	1			
" 25	2	2				1	1	
" 27		2	2				10	1
" 28		2	2		3		7	
" 29		2			1		5	
" 30					1		3	
" 31		1				1	6	
Totals	7	10	7	2	6	3	32 + 1 †	1 + 3 †

2. *The Distribution and Occurrence together of Pseudopontia and its Pierine Associates*, by Dr. S. A. Neave.

As regards my own personal experience of the three butterflies in question, perhaps the most interesting points connected with them are their distribution and relative abundance. *Leptosia (Nychitona) medusa* is, of course, very common and widely distributed in Africa. It is by no means confined to

* The total captured was 39 of which one has been mislaid, one taken July 25 is without abdomen, while of four dissected specimens taken July 28 (1), July 29 (2), and July 31 (1), three are females and one a male. These latter four are therefore added to the totals in the table.

† See the above note.

forest, and may occur in comparatively thin bush. *Pseudopontia paradoxa* seems to be limited to the Western Equatorial faunistic region of Africa though it occurs nearly up to the extreme edges of it. I have taken it in South-west Katanga not very far from the Congo-Zambesi watershed, and in Uganda it is not uncommon in forested country as far east as the forests at the western and southern foot of Mt. Elgon. Though a forest species, it is not rigidly restricted to dense forest and deep shade. *Leuceronia pharis* is a typically dense forest insect and never occurs outside such a habitat. It has a relatively short season on the wing, and is usually fairly abundant where it occurs. It is found in dense forest areas across Uganda into Kenya Colony as far east as the foot of the Nandi Escarpment. Both *P. paradoxa* and *L. pharis* have the same sluggish, floating flight as *L. medusa*. This is particularly striking in the case of *L. pharis*, in view of the active and vigorous flight of its allies.

3. *Pseudopontia paradoxa*; its Affinities, Mimetic Relations, and Geographical Races.—Dr. F. A. DIXEY said that he had been asked to supplement Prof. Poulton's communication with some remarks on the structure and probable affinities of this curious and isolated form. It was first described by Felder (Pet. Nouv. Ent., i, No. 8 (1869), p. 30) in the year 1869, from a specimen captured at Calabar. He considered it to be a Pierine allied to *Pontia* (*Nychitona* Butl.). His name for it was *Globiceps paradoxa*.

In 1870 Plötz (Stett. Ent. Zeit. (1870), pp. 348, 9, Taf. III (sic), fig. 1 a-f. N.B. The plate itself is numbered Taf. II) described and figured *Pseudopontia calabarica*, which Hewitson (Pet. Nouv. Ent., No. 15 bis and No. 23, 1870) rightly pointed out to be the same insect as Felder's *Globiceps paradoxa*. Hewitson went on to say that the insect was evidently a moth, and to criticise Plötz's figure on the ground that the artist had represented the antennae as knobbed, thus giving it the deceptive appearance of a butterfly. In his opinion that it was a moth, he was followed by Butler (Cist. Entom. i (1870), p. 57). R. Felder (Pet. Nouv. Ent., No. 24, 1870) replied to Hewitson's strictures by publishing an accurate figure with the antennae knobless, as in nature. He gave

reasons for considering it to be a butterfly, and maintained that all its characters approximated it to the group of Pieridae, especially mentioning its bifid claws, a well-known Pierid character.

The venation, palpi, claw and scales were figured by Schatz (Exotische Schmetterlinge, ii (1885-6), p. 65; Taf. 4, a-c), who had no doubt that *Pseudopontia* is a true Pierine; placing it between *Pontia* and *Leucidea*. Speaking of the venation of the hind-wing he says that "the costal and subcostal apparently cross one another." This condition is represented in his figure, as it was still more distinctly in the original figure of Plötz. What the real condition is will be shown later.

Aurivillius (Rhop. Aethiop. (1898), p. 386) considered it to be unquestionably a butterfly, and in his book on African Rhopalocera includes it among the Pierines, putting it just before *Leptosia* (*Nychitona* Butl.).

Pseudopontia was submitted to a careful examination by Enzo Reuter (Ueber d. Palpen d. Rhopal. (1896), p. 228). He pointed out that the palpi are quite different from those of all other Pierines, recalling those of *Hepialus* and in his opinion probably representative of a very old type. On the other hand, he says, the "basalfleck" corresponds fairly well with that of some genuine Pierines, but it again is of very primitive development. The isolation of *Pseudopontia* is shown also by its neuriation and its moniliform, clubless antennae. He sees no intimate relation between *Pseudopontia* and other Pierines; but, on the other hand, he finds no specific Heterocerous character. The antennae are Rhopalocerous. On the whole, especially as the venation does not absolutely defy comparison with that of some genuine Pierines, Reuter inclines to consider it as a subfamily of equivalent rank to the "Pieridinae," believing it to be probably a survival of an ancient, long-extinct stem.

Grote (Proc. Amer. Phil. Soc., Vol. xxxvii (1898), pp. 40, 41; Entom. Rec., x (1898), pp. 213-215) began by acquiescing in the view that it was a Pierine, but afterwards placed it among the Hesperids, adding that it had "nothing to do with Papilionces."

Dr. Jordan has shown that the antennae, in spite of their clubless condition, are certainly Pierine (Nov. Zool., v, 1898, pp. 376, 382, Pl. xiv, f. 28).

A curious point remains. Aurivillius, both in his own book and in Seitz's "Macrolepidoptera," has included in the genus *Pseudopontia* a second supposed species, *Pseudopontia cepheus* Ehrm., but in each case with a caution that it may not belong to this genus. The original description by Ehrmann leaves little doubt that his insect, which came from Grand Sess in Liberia, is a *Nychitona*, and not a *Pseudopontia* at all.* In our Proceedings for 1906, pp. lxi, lxx, speaking of *Pseudopontia paradoxa* and *Nychitona medusa*, I said, "It may well be anticipated that future observation will show their likeness in appearance to have a mimetic significance." From what has been said, it seems likely that the deception has at any rate been successfully exercised upon a human expert. Another confirmation came from Dr. Neave's observations in the field. In 1907 he wrote, "the two forms inhabit exactly the same localities and are barely distinguishable from each other on the wing" (Proc. Ent. Soc. Lond., 1908, p. xiii). It may be worth mentioning that Dr. G. D. H. Carpenter, writing in 1915, speaks as follows concerning *Leuceronia pharis*, a butterfly which I considered (*loc. cit.*) to belong to the same mimetic combination: "*L. thalassina* (both ♂ and ♀) frequently assembles to drink at moist spots, often almost entirely by itself, but sometimes mingled with others, whereas *pharis* is purely a flower-frequenter. In my own mind I had put it with *Nychitona medusa*; its whole appearance and feeble build and manner of flying suggested close relationship to *medusa*" (Proc. Ent. Soc. Lond., 1915, p. xcvi). Dr. Neave's and Dr. Carpenter's conclusions are confirmed and *Pseudopontia* shown

* Ehrmann's description is as follows: "Male—Upperside of all the wings pure white; apex of primaries has a sharp cut square black spot, and in the sub-apical space there is a medium-size black triangulate spot. Underside of primaries, the ground-colour is the same as above with the markings on the apical and sub-apical space faintly reproduced; the basal space is slightly shaded with pale green, marbled with faint black striae. Expanse, 1½ inch. Types from Grand Sess, West Africa." *Journal of New York Ent. Soc.*, vol. ii, No. 2, June, 1894, p. 77.

to be a member of the same association by the table of captures printed on p. lx.

For the reasons already stated, it seems improbable that Ehrmann's *cephus* is a second species of *Pseudopontia*. It is nevertheless the case that there are two geographical forms of *P. paradoxa*, which may perhaps deserve to rank as subspecies. These two forms, so far as I have observed, show a constant though slight difference in venation. In all the specimens that I have examined from Sierra Leone and Nigeria, the costal and subcostal veins of the hind-wing are united either by direct contact, or by a connecting bar (Plate B, fig. 7). The same condition obtains in all Dr. Carpenter's specimens from Uganda. But in every example from the Luebo district (Kassai river) in the southern Congo, the two veins are separated by a distinct interval, running parallel with each other for a short distance, but never joining (Plate B, fig. 6). My friend Dr. Eltringham has kindly mounted for me a hind-wing of each kind, with the veins stained to show the difference; these will be thrown on the screen.

On the whole, we seem to be justified in saying that *Pseudopontia*, though clearly an isolated form, shows more correspondence with the Pierinae than with any other subfamily. The discovery of its immature stages, which are at present unknown, would no doubt settle at once the question of its affinities.

Pseudopontia paradoxa australis subsp. nov.—Differs from typical *P. paradoxa* Feld., only in the fact that the costal and subcostal veins in the hind-wing are separated by a distinct interval, running parallel with each other for a short distance, but never joining. The same two veins in typical *P. paradoxa* are united, either by direct contact, or by a connecting bar.

Southern Congo, Kassai River, Luebo district.* Types, ♂ and ♀, in Hope Collection, Oxford.

* A single specimen in the Hope Collection bears the label "Cameroons; Rutherford. Hewitson 1874." The data require confirmation before they can be accepted as beyond doubt.

EXPLANATION OF PLATE B.

Pseudopontia paradoxa.

- FIG. 1. Extremity of ♂ abdomen (semidiagrammatic) showing armature *in situ*.
2. Armature dissected out, side view.
3. " " " ventral view.
4. " " " dorsal view, showing the lobe-like expansions above the claspers.
5. Egg, drawn from examples removed from bodies of dried specimens.
6. Neuration of hind-wing of Southern Congo examples.
7. " " " " examples from other localities.
8. " " fore-wing (not differing in different localities).

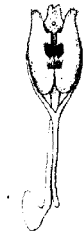
(Note the swollen condition of the basal part of median nervure, in both fore- and hind-wings.)



1



2



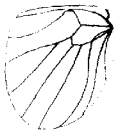
3.



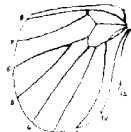
5.



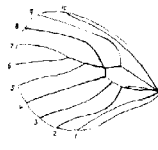
4.



6.



7



8

L. ELTRINGHAM del

4. *Is Pseudopontia a Pierid, or What?* by Dr. R. J. Tillyard.

[From the letter accompanying Dr. Tillyard's note.]

Cassell Institute,
Nelson, N.Z.
March 6, 1922.

After recovering from my accident, I went for a trip to Australia last October, and took two specimens of *Pseudopontia* with me for my friend Mr. G. A. Waterhouse. He examined them and declared at once that they were certainly not Pieridae, but he would not give detailed reasons; only said that they were extraordinary beasts, not belonging to any known family. I concurred at the time, thinking he must surely be right, but before writing to you, I set down carefully the best definition of a Pierid I could find, and tested *Pseudopontia* by that definition. I was surprised, and rather pleased, to find that this careful test shows your butterfly to be in every respect what it looks, viz. a true Pierid. The argument is set forth fully in another sheet enclosed herewith [printed below].

I would say that this butterfly is the most highly specialised Pierid I have yet set eyes on, and I anticipate that its larva and pupa will show true Pierid characters.

[In the account printed below Dr. Tillyard uses his new notation developed from that of Comstock and Needham. By means of the numbers in parentheses his terms can be followed on figs. 7 and 8 of Plate B.]

To answer the question "*Is Pseudopontia a Pierid?*", we have first of all to ask: What constitutes a Pierid? Leaving out of account the early stages, which are unknown, but which, if known, would certainly solve the problem, we may define a Pierid by the following characters:—

Antennae close together at bases. Front pair of legs perfect in both sexes. Hind tibiae with terminal pair of spurs only. Fore-wing with one or more branches of Rs (7-9) stalked beyond the cell. Hind-wing with precostal spur present, but no closed precostal cell; also with vein 3A (1a) present.

Applying these tests, we find that *Pseudopontia* possesses
PROC. ENT. SOC. LOND., V, 1922.

every single one of the above characters exactly. *Therefore it is a true Pierid.* Its peculiarities are all of less than family value, and suggest at the most that it might form a separate subfamily Pseudopontiinae [as adopted by Prof. Aurivillius in Seitz]. It is remarkable for the following characters:—

(a) The strong curving of R_1 (9 in F.W., 7 in H.W.) in both wings, and, in the hind-wing, the failure of R_1 (7) to continue coalesced with Sc (8) distally. A parallel to this can be found in some male Psychidae. Normally, Sc (8) and R_1 (7) are fused distally in all Heteroneurous hind-wings. Separation is not an ancestral character here, but is due to enlargement of the area of the wing served by these two veins.

(b) The smallness and narrowness of the cell in both wings.

(c) The completion of the precostal spur in hind-wing to the wing-margin (most Pieridae have it stopping short of the margin).

(d) The extraordinary manner of forking of the branches of Rs (7-9) in fore-wing, together with loss of two branches. (*Delias* and other genera have lost two branches, but the manner of branching is altogether peculiar).

(e) Most of the wing-scales are very highly specialised, of a deeply bifid type, with normal scales interspersed.

I think the characters (a)-(d) indicate descent from a smaller-winged form with normal-sized cell for such form, with sudden evolution of a larger and more rounded wing by expansion of the area beyond the cell. I anticipate that the larva and pupa will show normal Pierid characters.

5. *On the Male Armature and the Egg of Pseudopontia paradoxa*, by Dr. Harry Eltringham.

The armature of *P. paradoxa* is of a peculiar structure unlike that of any other species known to me. Plate B, fig. 1, shows the apparatus *in situ*, whilst figs. 2, 3, and 4 show different aspects of the organs dissected out from another specimen.

The uncus is short, broad and slightly bifid. The claspers are of characteristic shape, and just below the point where the oedeagus is extruded they are heavily chitinated and

slightly dentate, whilst anteriorly to this dentate portion is a flat brush of modified scales.

Internally and on the dorsal side of each clasper is a delicate membrane swollen out into a kind of lobe. The saccus or vinculum is slender and unusually long, as is also the oedeagus shown in all the figures.

The whole structure of these organs gives no clue to the systematic position of the species. In my opinion the structure of the male armature is rarely to be relied on as an indication of more than specific affinity. Reference to the figures of the male armatures of the Genus *Acraea* (Trans. Ent. Soc., 1912, Plates VII to XV) will show that so great is the variety of structure, it would be impossible to describe a typically *Acraeina* form of genitalia.

The Egg.—By softening bodies of female examples in caustic potash, it was found possible to dissect out a few eggs in various stages. None of these seemed to be quite mature. The shape of the most advanced could be more or less restored by mounting in fluid, whilst the external structure could most easily be seen in dried examples, though these were, of course, much shrivelled.

Fig. 5 is a drawing made up from both moist and dried examples and probably gives an approximate idea of the shape and appearance of an almost mature egg. It has nine longitudinal ribs ending in slight projections at the narrow or upper end, whilst there are faint indications of horizontal lines between the longitudinal elevations. Though not typically *Pierina* in form it at least resembles the eggs of that family more than those of others so far as they are known to me, and to that extent supports the view that *P. paradoxa* is an aberrant *Pierina* species.

NEW AND RARE LEPIDOPTERA.—Mr. G. TALBOT exhibited the following Lepidoptera on behalf of Mr. J. J. JOICEY.

AFRICA.—A new species of *Charaxes* from W. Kivu, collected by T. A. Barns at 8500 feet; allied to *lasti* Smith.

A new subspecies of *Pieris brassicoides* Lucas, collected by T. A. Barns, in the highlands of the Great Craters, Tanganyika Territory, between 7500 and 8800 feet. The species was hitherto known only from Abyssinia.

NEW GUINEA.—Collected by Messrs. Pratt, in the Weyland Mountains.

Panacra excellens Roths., a very distinct species, obtained at 2000 feet.

Eucocyttia meeki Roths. A ♂ obtained at 6000 feet. Sir G. Hampson created the family Eucocytiadae, for this and *Cocytia*, but there is strong reason for thinking that these insects are Noctuids or Agaristids. A detail not referred to in the original description of *Eucocyttia* is that of the possession of a thick tuft of androconia-like scales below the anus on the ventral surface. Also the valves are furnished with hair of a carmine colour on the outer side.

Lord Rothschild has suggested that this subfamily should really come after the Momiinae in the Noctuidae.

Among Zygaenids, three new species of *Eusphalera* and one of *Pidorus* were obtained.

S.W. SUMATRA.—Taken by Messrs. Pratt on Mount Korintji.

Papilio payeni ciminius Fruhst., ♂ at 5000 feet, ♀ at 2000 feet. The female was previously unknown. This race is nearest the Java form.

Pyrameis samani Hag. Obtained at 7300 feet. Until the expedition of Robinson and Kloss this species was only known by two specimens. That expedition obtained a series, as also did Messrs. Pratt.

A species of *Psaphis* that may be a new form. These Zygaenids strongly resemble Geometrids of the genus *Dysphania*. Obtained at 7300 feet.

CENTRAL CERAM.—A new race of the Zygaenid, *Aglaope hemileuca* Roths. This species was only known hitherto from New Guinea. A specimen is shown illustrating a black aberration. This race differs in the position of the black discal band and in the position of vein 7 of the fore-wing. Obtained at 3000–6000 feet.

SUMBAWA. A new *Charaxes* allied to *C. nitebis* from Celebes, but very distinct. One ♀ specimen which was taken by W. Doherty and has remained many years in Mr. Elwes' collection.

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Papers.

The following papers were read :—

“ Elateridae of Seychelles Expedition,” by M. FLEUTIAUX,
communicated by Dr. H. SCOTT.

“ Transformative Deceptive Resemblance in Long-horned
Grasshoppers,” by Mr. B. P. UVAROV.

Wednesday, October 4th, 1922.

Mr. ROBERT ADKIN, Vice-President, in the Chair.

Obituary.

The deaths of the following Fellows were announced, and a vote of condolence with their relatives was passed : Dr. DAVID SHARP, F.R.S., one of the Special Life Fellows of the Society, Mr. HAMILTON H. DRUCE, Mr. ARTHUR HORNE, Mr. FRANK M. LITTLER, and Mr. G. O. SLOPER.

The Collection of Portraits.

The TREASURER made a statement as to four new portraits that had recently been hung in the Meeting-room, and a portrait of the late Dr. Sharp presented by Mr. W. J. Lucas, for addition to the collection, was gratefully accepted.

Election of Fellows.

The following were elected Fellows of the Society :— Messrs. GUY BABAULT, 10, Rue Camille-Perier, Chatou, Seine-et-Oise, France; ALBERT E. WRIGHT, Brunleigh, Kent Bank Road, Grange-over-Sands.

Exhibitions.

INSECTS FROM THE FARN COLLECTION.—Mr. W. G. SHELDON exhibited an example, taken in the New Forest, of the very rare type form of *Sarothripus revayana* Scopoli, or very near it, with an example of *S. ab. ramosana* Hb., for comparison; also an example of the very rare (in Britain) *ab. degenerana* Hb., of the same species. Of this form he knew of three examples

purporting to be of British origin: the one exhibited, labelled "Chattenden," one reported to have been taken in the New Forest by the late E. Morris, which is presumably now in the collection of Lord Rothschild, and one originally in the Howard Vaughan Collection, later in that of S. Webb, disposed of at the sale of his collection, and the present location of which is not known.

Mr. Sheldon also exhibited five examples of *Acrobasis tumidana* Schiff., from Darenth Wood, 1873-5, with the nearest related British species, *A. zelleri* Rag. = *A. tumidella* Zk., for comparison.

THE PROCRYPIC RESTING ATTITUDE OF POLYGONIA C-ALBUM L. AND CERTAIN ALLIED SPECIES.—Prof. POULTON exhibited a living specimen of *P. c-album* captured by Commander Walker at Oxford a few weeks earlier. He called attention to the out-turned edges of the wings in the resting position, as described in Proc. Ent. Soc., 1922, p. xix. The exhibited individual had been watched daily by Mr. A. H. Hamm, who observed that in darkness the fore- and hind-wings were only separated by a narrow chink passing inwards from the strongly marked bay formed by the hollowing of both approximated angles. When exposed to diffused daylight the fore-wings were very slowly moved forward until the narrow chink became a wide gap. In direct sunlight, or as the result of a shake or jar, the change of attitude was made comparatively rapidly.

Dr. R. C. L. Perkins, F.R.S., wrote on September 29 that he too had "noticed that raising or separation of the front from the hind-wing in *c-album*, and not only in this but in the 'Tortoiseshells' and I think in other *Vanessas*. They also do this when disturbed during hibernation."

In the latter *Vanessids* it was probable that the change of attitude was a preparation for flight—impossible when the costal margins of hind- and fore-wings lay one over the other, as in the resting position for which the under surface pattern was adapted. In such species the change of attitude necessary for flight detracted from the procrypic significance by exposing the part of the fore-wing covered by the hind when the resting butterfly was undisturbed.

C-album offered an interesting contrast in this respect,

for the changed attitude tended rather to enhance the effect by increasing the resemblance to a tattered and weather-beaten fragment of dead leaf. The exposed parts of the advanced fore-wings harmonised with the rest of the pattern, while the wider gap apparently added to the procryptic effect of the jagged margin. It was likely that change of attitude in *c-album* was originally a preparation for flight now utilised in an exaggerated form as aid to concealment.

[*Note.* October 18 :—Since the last meeting the exhibited butterfly had been placed in a dark cellar. When examined on October 17 it was observed that the fore-wings were drawn back so far as to close the narrow chink altogether. The butterfly was undisturbed, but the light or perhaps heat of the candle, held at six or eight inches distance, at once caused a very gradual movement forward of the fore-wings and the formation of a narrow cleft. The observation was only continued for a short time, but it was hoped that future investigations would determine whether there was normally a diurnal change of attitude in these butterflies when exposed to normal daylight and darkness during hibernation.]

Concerning the interpretation of the movement in *V. urticae*, as a preparation for flight, Dr. Perkins wrote on October 2 :—
 “It may be, as you say, with regard to *urticae*. I think they often raise the front wings without actual flight taking place in the circumstances I have mentioned, but it may be done with a view to flight, as sometimes it is a preliminary to the wings being spread open. These may then be closed again without flight taking place.

“Of course ‘Meadow browns’ and such-like raise or depress the fore-wings to hide or expose the ocellus.” *

During the past season living *Pyrameis atalanta* and *V. urticae* had been observed in the resting attitude, and it was found that in these also the edges of the wings were slightly out-turned, especially at the prominent angles, but to a far less extent than in *c-album*. The observations were made upon captured specimens at St. Helens, Isle of Wight, and bred *urticae* at Oxford.

* For a discussion of these movements see Trans. Ent. Soc. Lond., 1902, pp. 371-2, 440-1.

Mr. E. E. GREEN said that during the past summer he had bred *Vanessa antiopa* and had observed that the wing-edges were out-turned, especially at the marginal prominences, in the resting position.

RARE ECUADOR BUTTERFLIES.—Mr. ARTHUR DICKSEY exhibited *Morpho fruhstorferi*, drawing attention to the wonderful opalescence of fresh specimens, in contradiction of Fruhstorfer's statement that they are chalk white.

Morpho sulkowskyi sirene, ♀, with much stronger and blacker markings than the type form and with the margin of the hind-wings somewhat serrated.

A new race of *Morpho didius*, ? ♂ and ♀, more intense blue than *didius* above and a black brown underneath instead of red brown, with very much stronger markings.

Coenophlebia archidona, ♀, of which, after inquiry, he could only find one other specimen. With it was a normal male from Colombia and a normal male from Ecuador, and also a very dark male. From its appearances it would seem as if this female, which was lighter than any, had come from Colombia. The great distinguishing point of the female is the complete absence of the triangular silver mark on the middle of the costa of the underside of the fore-wing.

SCENTS OF BUTTERFLIES.—Dr. F. A. DIXEY said that, so far as he was aware, no record existed of the scent of *Synchlœ daphidice*, ♂. He had lately had an opportunity of testing it for scent at Lisbon, where it was abundant in August of this year. Of three males examined, one had no perceptible odour, but each of the others had a distinct flowery scent, suggesting that of the sweet-pea. It was noticeable that the scentless male was in fresh condition, while one of the males which gave a distinct scent was rather worn.

Another species not previously examined for scent was *Argynnis lathonia*. A fresh male specimen captured in Madeira emitted a distinct fragrance, like that of the garden flower known as "heliotrope."

The scent of British specimens of *Ganoris rapae* had been compared by Prof. Image to that of sweetbriar, in which comparison both Dr. Longstaff and the present speaker agreed. But according to the experience of the latter in

this country, the scent in *G. rapae*, ♂, was often faint, and not seldom absent altogether. It was therefore worthy of remark that of ten male specimens from Lisbon and Tenerife respectively, not one gave a negative result when examined for scent. All had a strong, distinct odour of sweetbriar, in one case with an added pungency like peppermint. In another one it was observed that the scent was still perceptible some hours after death. Females from Lisbon, Madeira and Tenerife were tested, but in no case was any odour detected in individuals of that sex.

TWO BEETLES NEW TO BRITAIN.—Mr. DONISTHORPE exhibited specimens of *Aulonium ruficorne* Ol., and *Hypophloeus frazini* Kug., two species of Coleoptera new to the British list, together with their respective hosts *Tomiscus laticis* F., and *Tomiscus sexdentatus* Boern., taken by Prof. Beare and himself in Scots pine in the Forest of Dean, August 3 and 4, 1922.

Wednesday, October 18th, 1922.

Prof. E. B. POULTON, D.Sc., M.A., F.R.S., etc., Vice-President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—Messrs. S. STUART LIGHT, Redcot, Linton Road, Hastings; G. H. E. HOPKINS, Downing College, Cambridge; V. G. L. VAN SOMEREN, C.M.Z.S., M.B.O.V., Nairobi, Kenya Colony.

Exhibitions.

LEPTURA RUBRA FROM NORFOLK.—Mr. DONISTHORPE exhibited a number of specimens (♂♂ and ♀♀) of *Leptura rubra* L., that he had taken at Horsford in Norfolk in August last. He pointed out that this beetle was first taken in Britain by Mr. Thouless, who captured a specimen on the wing at Horsford on August 6, 1918, and each year since he had taken a small number of specimens. This year the exhibitor had observed

it in considerable numbers over a wide area, and his opinion that it had been present in this district for many years past.

A PECULIAR ORGAN OF THE NOTODONTIDAE.—Dr. JORDAN showed some Notodontidae and said that in a large number of exotic species of this family the males have on the sides of the abdomen a peculiar organ not met with outside the Notodontids. It is particularly frequent in American genera (*Heterocampa*, *Salluca*, *Hapigia*, etc.). In the species in question the upper margin of the sternite of the fourth segment is widened into a lobe of varying size, the lobe bearing a spine or a bunch of spines at the apex or a regular comb of many spines at the posterior margin. The lobe partly covers a deep cavity, in which evidently opens a gland. The organ is present in all the species in which the scaling on the underside of the hind-wing is modified in some way, but is also found in a number of species with normal scaling. The function of the organ seems to be that of a transmitter of scent from the abdomen to the hairy hind-tibia and hind-wing. An illustrated account of the organ will appear in another place.

SEASONAL CHANGES IN THE COLOURS OF THE FEMALE BELLARGUS.—Prof. POULTON said that he had received the following interesting communication from Dr. R. C. L. Perkins, F.R.S. :—

"September 27, 1922.—I collected a fine series of ♀ *A. bellargus* (*adonis*) in the exact spot where we obtained them last year, i.e. from the same restricted colony (on the Cotswolds) which extends over a few acres of hillside. It was very interesting. Not a single blue ♀ in last year's lot, but many almost like *astrarche* (*agestis*) in colour: this year's females for the most part highly suffused with blue. Owing to the season being later this year, I only had a few hours on two of the last days of our stay, or perhaps I should have taken some like the glorious blue specimens I sent to C. G. Barrett in the excessively wet summer of 1888 or 1889, when the species was only coming out fresh in late September or October."

Dr. E. A. Cockayne had kindly directed his attention to two papers by Dr. G. G. C. Hodgson, who had also observed

the effect of cold wet summers in producing blue females of *Lycaenidae*:—

"Notes on the effect of Climatic Conditions on Sexual Dimorphism" (Trans. City of London Ent. Soc., 1908, xviii, pp. 23-32).

"Some notes on *A. bellargus* with references to allied species" (*Ibid.*, 1907, xvii, p. 43).

THE SUDDEN APPEARANCE OF THE WESTERN HIND-WING PATTERN IN MALES OF *PAPILIO DARDANUS* BROWN, AT KIBWEZI, KENYA COLONY.—Prof. POULTON exhibited the male specimen referred to by Mr. W. Feather in the following letter, dated August 27, 1922. Males from the West Coast (Lagos), W. and E. Uganda, Nairobi, and Mombasa were also shown, together with one possessing the *tibullus* Kirb. pattern, collected by Dr. S. A. Neave at Kibwezi (about 3000 ft.), April 2-4, 1911.

"I am sending you a specimen of *Papilio dardanus tibullus* which has the black band on hind-wing broken through by yellow. Previous to 1922 I have never seen a specimen here with the band thus interrupted. This year during the dry season (from early May to the last week in October—if the season is a normal one) all the specimens I have examined up to the present date have had a most unusual amount of yellow on the outer margin of the hind-wing. Now, the place where *tibullus* occurs is ground that is covered by lava rocks with underground water; consequently, the bush and trees are in leaf all the year. So it is rather hard to see why the dry season should affect this insect. I very seldom see a specimen far from this lava-covered ground."

Prof. Poulton said that it was difficult to believe that the sudden appearance of these males at Kibwezi was due to the dry season. East Africa with the most heavily marked males (*tibullus*) was drier than West Africa with the less black *dardanus*. The pattern of the latter form extended from the West Coast to the high Kikuyu Escarpment in Kenya Colony, where it appeared in the small mountain form *polytrophus* Jord., possessing a male armature similar to that of the East Coast *tibullus*. Transition between this and the *dardanus*

armature was found in Uganda, especially towards its eastern border, although the pattern was always that of the less heavily marked western *ardanus*. At Nairobi, near the Kikuyu Escarpment but at a lower level (about 5500 ft.), the males were larger and their patterns transitional between *polytrophus* and *tibullus*, comparatively few retaining the reduced hind-wing band of the Western form.

Dr. JORDAN considered that the structural differences in the male armature were not such as to prevent interbreeding, and it was probable that the whole community from the West to the East Coast was syngamic. In these circumstances a fluctuation in the line of demarcation between adjacent areas with different patterns was by no means improbable and afforded the most likely interpretation of the appearance of males, only differing from those of *polytrophus* by their greater size, at Kibwezi, over a third of the distance between Nairobi and the East Coast. It would be of the highest interest to continue the observations in future seasons and also to determine whether the same change has occurred in localities between Kibwezi and Nairobi and also in those still nearer to the East Coast.

DELAYED DEVELOPMENT A RESULT OF THE IN-BREEDING OF *ABRAXAS GROSSULARIATA*.—Prof. POULTON said that since the summer of 1917 he had, with the kind help of Miss Balfour, been breeding families which had all sprung from the eggs laid by a female taken in the garden of St. Helens Cottage, St. Helens, Isle of Wight. No fresh blood had been introduced at any time, but apart from this no attempt was made to keep the different strains separate. One of the earliest effects observed was the delaying of development which had reached its climax in a larva of the fifth generation exhibited to the meeting. This caterpillar, the only survivor of its family (although one other family produced several imagines during the past summer), and now about half grown, had been sleeved out upon *Prunus pissardii* on July 21, 1921! It was apparently healthy, and had been observed freely feeding on the morning of that day (October 18).

The results were so extraordinary that it might be supposed that a larva hatched in 1922 had been accidentally

included in a sleeve containing those of the previous year. This interpretation was excluded by the fact that the larva had reached by last July a much larger size than that attained even so late as October, by any of those hatched in 1922.

Papers.

The following papers were read :—

"On Schmit-Goebel's Types of Carabidae," by Mr. H. E. ANDREWES.

"On the Larva and Pupa of *Sabulinea*," by Dr. R. J. TILLYARD.

"On Endomychid Coleoptera," by Mr. G. J. ARROW.

"On the Biology of some British Neuroptera," by Mr. C. L. WITHERCOMBE.

"On the Rhopalocera of the 1921 Mt. Everest Expedition," by Mr. N. D. RILEY.

Wednesday, November 1st, 1922.

Prof. E. B. POULTON, M.A., F.R.S., etc., Vice-President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—
Messrs. A. N. BURNS, Salisbury Road, Rose Bay, Sydney, New South Wales; R. T. DAUBENEY, B.A., Herne Vicarage, Herne, Kent; C. C. GHOSH, B.A., Agricultural College, Mandalay, Burma; L. G. HIGGINS, M.A., F.R.C.S., Heatherside, Woking, Surrey; J. F. MARSHALL, M.A., Seacourt, Hayling Island; A. E. MOORE, Brookside, Brent Mead Avenue, Golder's Green, N.W.; A. MUSGRAVE, Australian Museum, Sydney, New South Wales; Miss E. K. PEARCE, Kempston, Bournemouth West; Messrs. E. PIAZZA, 4734, 48th St., San Diego, California, U.S.A.; J. PRICE, 165, Corporation Street, Stafford; the Rev. W. H. RICHARDSON, 2, Wanderers Avenue, Wolverhampton; Messrs. A. H. RUSTON, Aylesbury House, Chatteris,

Cambs.; F. E. WILSON, Jacana, Darling Road, East Malvern, Melbourne; and H. E. WINZER, 2, Mead Road, Cranleigh, Surrey.

Gift to the Society.

The TREASURER announced that he had received £500 towards the Housing Fund from the Misses Chapman on behalf of their brother, the late Dr. T. A. Chapman, F.R.S.

Exhibitions.

A NOTE ON BELENOIS GIDICA GODT.—Dr. F. A. DIXEY exhibited specimens and drawings of the genitalia and scent-scales of *Belenois gidica* Godt., with those of some other species of *Belenois* for comparison. He said:—

“The old-world Pierine group to which the well-known forms *B. calypso* Drury, *B. zochalia* Boisd., and *B. mesentina* Cram., belong, may be treated either as a section of *Pieris* (Trimen, Aurivillius) or as a separate genus under the name *Belenois* or *Anaphaëis* (Butler, Fruhstorfer). Though capable of some subdivision, it constitutes in most respects a natural assemblage; but the divergence in some structural points shown by one group of subspecies seems sufficient to raise a doubt whether it is properly included in the same genus or section with the other species just referred to. The group of subspecies in question is that included under the general head of *Belenois gidica* Godt.

“A structural feature common to all the ordinary forms of *Belenois* is the prolongation of the clasper in the male into a long posterior spine directed backwards. There is no posterior spine on the clasper of *gidica*, but only a slight convexity in the corresponding situation. Another point is the structure of the scent-scale. In all the other species of *Belenois* the sides of the lamina are nearly parallel or slightly sinuous, the apex is comparatively sharp, the distal border is furnished with an array of well-developed fimbriae, and the accessory disc is large, rounded, oval or chestnut-shaped. In *gidica* the lamina is slug-shaped, dilated towards the base; there are no fimbriae, their place being taken by a few minute tubercular processes of the blunt distal border. The accessory

disc is almost non-existent, being reduced to a hardly perceptible dilatation of the proximal end of the footstalk.

"These points are all easily visible in the drawings exhibited, which represent the clasper and scent-scale of the male *B. gidica*, compared with the corresponding structures in other species of *Belenois*.

"So far, however, as neuration goes, *gidica* might well be a *Belenois*. It is also worth noticing that its larva, like that of at least one other species of *Belenois*, is stated to feed on *Capparis*."

In the course of the discussion that followed Dr. Dixey's remarks, Commander WALKER said that *Belenois teutonia* feeds on *Capparis*, and Dr. MARSHALL said that *B. mesentina* has the same food-plant in South Africa.

THE TYMPANAL ORGAN OF SPEIREDONIA (NOCTUIDAE).--After having described the special abdominal tympanal organ which characterises the noctuiform families of moths, and drawn attention to the great diversity obtaining in the development of this organ within the families, Dr. JORDAN said that in those Noctuid genera in which the first abdominal pleurum forms a large lobe or dome over a deep tympanal cavity the first stigma is found within the cavity, while in the species of the allied families with a similarly large dome (often resembling a bladder in dorsal aspect) the stigma is placed on the outer surface of the pleurum, visible in a lateral view of the abdomen. In *Speiredonia* and some allied Noctuids a specialisation obtains that is worth recording. As a rule the Noctuids have, in the cavity, a vertical ridge in front of the stigma, the ridge being often a mere line, but sometimes enlarged into a long lobe. In *Speiredonia* the ridge is moderately raised, and its edge is drawn out into a row of hair-like, branched processes which project forward over the inner portion of the tympanal cavity and almost touch the thorax. These false hairs are fairly stiff and end in very thin points. The hedge thus formed may possibly serve as a guard against the penetration of foreign bodies into the deep recesses of the cavity where the delicate tympanal membranes are found; but it appears more likely that the filaments are a means of increasing by their vibration the strength of the sound-waves.

Dr. ELTRINGHAM gave some account of similar organs in Geometrids. Mr. SWYNNERTON said that in the course of some experiments on the food preferences of birds, he had been unable to detect that Noctuid moths have the power of appreciating sound at all in the ordinary sense of the word. The vibrations caused by the fluttering of another individual are, however, detected instantly.

Dr. ELTRINGHAM said that he thought that hearing in insects, like scent, is probably selective.

HOMOEOSIS IN COENONYMPHA PAMPHILUS.—Dr. E. A. COCKAYNE exhibited a ♀ of *C. pamphilus* L., in which a large area on the underside of the right hind-wing has the colour, pattern and scaling of the homologous area of the underside of the right fore-wing. The wing is a little smaller than the other, but the shape and venation are normal. It is the fifth example recorded in this species, and it was taken by Mr. F. J. COULSON at Walton Heath on July 3, 1922.

AN INTERSEX OF MYDAAE DUPLICATA.—Mr. J. E. COLLIN exhibited an "intersex" of *Mydaea duplicata* Mg. (Diptera), captured by Prof. J. W. Carr in Sherwood Forest on July 6, 1919, apparently exactly similar to the two specimens described by Schnabl (W.E.Z. 1890, pp. 177-181). This "intersex" was described as a new species by Zetterstedt in 1860 under the name of *Anthomyza flavogrisea*. Prof. Carr's specimen makes the fourth known example. The exhibitor called attention to the work that had been done recently in America by Sturtevant and others in the production of intersexes in breeding experiments with *Drosophila melanogaster* and *D. simulans*.

LIVING LARVAE OF A NEMOPTERID FROM THE EGYPTIAN DESERT.—Prof. POULTON exhibited, on behalf of Mr. R. N. Willmer, three living Nemopterid larvae and an imago taken in the Wadi Digla, near Cairo, in September, 1922. The latter, which might not be the same species as the larvae, was identified by Mr. H. Champion as probably *Klugina aristata* Klug. The larvae, kept with some of the blown desert dust in a glass-topped pill-box, and for exhibition in a glass tube, seemed to be quite healthy after many weeks without food. Quite recently insect food had been offered to them, but it was

uncertain whether they availed themselves of it. It was certain that they are not cannibals, for all were kept in the same small tube and one was much smaller than the others.* The remarkable jerky movements of the long "neck" probably enabled the larva to pick up living food in a wide circle round its body, which was itself invisible against the dust. Mr. Willmer had written the following interesting account of the habits of these insects and the conditions in which they are found :—

"Three larvae found in caves in the steep banks of the 'wadis' or desert valleys. The larvae are to be found walking over the surface of a fine dust which covers all the rock ledges in the caves. They are rendered conspicuous by blowing on the dust and causing them to move.

"The larvae can sometimes be found under shelves of rock in the open, but they only appear to live where there is that fine dust which is so characteristic of the caves. Their food probably consists of other small insects and mites.

"The adult insect flies in the entrances to the caves just before sunset, and with its long hind-wings much resembles the spiders' webs which drape the walls of all the caves. They appear to be most common during August, but a few may be obtained in September. The larvae appeared to be in all stages of growth, but probably all were young.

"It is interesting to note that they appear to be far more common in the desert caves than in the Pyramids, where they were apparently first discovered; in fact, a search in the Pyramids proved entirely unproductive."

Mr. E. E. GREEN and Dr. IMMS gave some account of the habits of a somewhat similar species found in India and Ceylon, and Mr. BLAIR said that he had received the same or an allied species from Palestine.

* The above sentence was premature. About the middle of November the small larva was sucked dry by one of the others. The empty skin remained in a perfect condition.—E. B. P., November 28th, 1922.

Wednesday, November 15th, 1922.

The Rt. Hon. Lord ROTHSCHILD, M.A., F.R.S., etc., President, in the Chair.

The SECRETARY announced that the Council had nominated the following Officers and Council for 1923 :—

Officers.

President. E. E. GREEN, F.Z.S.

Treasurer. W. G. SHELDON, F.Z.S.

Secretaries. { S. A. NEAVE, M.A., D.Sc., F.Z.S.
H. ELTRINGHAM, M.A., D.Sc., F.Z.S.

Librarian. H. J. TURNER.

Council.

ROBERT ADKIN, E. C. BEDWELL, J. E. COLLIN, F.Z.S., J. DAVIDSON, D.Sc., F.L.S., J. J. JOICEY, F.L.S., F.Z.S., etc., F. LAING, R. W. LLOYD, W. G. F. NELSON, N. D. RILEY, Prof. E. B. POULTON, M.A., D.Sc., F.R.S., etc., Lord ROTHSCHILD, M.A., F.R.S., etc., and H. WILLOUGHBY-ELLIS, F.Z.S.

Election of Fellows.

The following were elected Fellows of the Society :— Messrs. A. E. BUTLER, The Nook, Clevedon, Somerset; G. W. HOLLOWAY, The Hill, Amberley, Glos.; the Rev. J. F. PERRY, St. Anne's Priory, Edgehill, Liverpool; G. B. RYLE, Pangbourne, Berks; B. STEWART, Lovell House, Leeds, Yorkshire.

Gifts to the Society.

The TREASURER announced the bequest of £1,000 by the late Mr. Hamilton Druce, the income from which is to be devoted to the Library. He also stated that Mrs. Newman had presented to the Society a portrait of the late Edward Newman, who was President of the Society in 1853-4.

Exhibitions.

A CECIDOMYID NEW TO BRITAIN.—Mr. C. L. WITHEYCOMBE said :—

"In May of this year I found under the bark of a felled birch tree in Epping Forest large numbers of larvae of a

Cecidomyid. The main interest at the time was in the fact that the larvae grouped themselves in star-shaped clusters of from six to forty individuals (photograph exhibited) with their anterior extremities directed inwards to a point. In this way they were evidently feeding. About one hundred clusters were seen along two feet of the birch trunk, after stripping. A few clusters were secured, and these emerged as flies late in June.

"Mr. F. W. Edwards of the British Museum (Natural History) has very kindly identified the insect for me and reports as follows :—'The Cecidomyid is apparently *Miastor hastatus* Kieffer, which was reared from larvae found under hornbeam bark in Lorraine. This species differs from *M. metroloous* Meinert, as figured by Kahle (Zoologica, Heft 55, 1908), in having larger eyes and a much more curved radial sector. *M. hastatus* is quite possibly identical with the earlier but insufficiently described *M. hospes* Winn.'

"Mr. Edwards informs me that adults of the genus *Miastor* have not previously been recorded as British, although larvae, possibly of this genus, are recorded by Bagnall (Lancs. & Ches. Nat., 1918).

"*Miastor* is, of course, the classical example of paedogenesis in insects, several larvae being produced in the interior of a single parent larva by internal budding. These then escape by rupture of the parent body wall and commence independent existence. It would be interesting to know whether each star-shaped colony is the produce of a single paedogenetic larva."

This exhibit gave rise to a discussion on the phenomenon of paedogenesis in which Messrs. COLLIN and BLAIR and Dr. IMMS took part.

THE SHREW-LIKE APPEARANCE OF A LASIOCAMPID MOTH FROM JAVA.—Prof. POULTON exhibited a photograph just received from Dr. Th. Mortensen, of the moth *Suana concolor* Wlk., in the attitude of rest. In this position the resemblance, both in size and shape, to a shrew was very striking, but inasmuch as Dr. Mortensen proposed to figure and describe this example himself the discussion of detail was postponed until after the appearance of his paper.

MIMICRY IN N. RHODESIAN LEPIDOPTERA: OBSERVATIONS NOTED ON THE SPOT.—Prof. POULTON said that he had recently come across the following passage in a letter written to him on January 28, 1907, by Dr. S. A. Neave from Kansanshi, N.W. Rhodesia:—

"I have taken one specimen of a most remarkable diurnal moth which, especially on the wing, is a very perfect mimic of a large *Teracolus* or *Belenois*. In fact I took it at first for a ♀ *T. regina*. I have also seen two specimens (which I did not have a chance of taking), of an astonishingly good *chrysippus* mimic, which would appear to be some species of *Euryphene* or some allied genus. The resemblance both in coloration and flight is wonderful. It occurs in the thickly wooded type of country which we get here."

Dr. Neave had informed him that the moth was the Saturniid, *Pseudaphelia apollinaris* Boisd., and that its Pierine-like flight differed widely from that of its allies. He also said that the butterfly was the female of *Diestogyna iris* Auriv. This species is referred to in the following passage from Dr. Neave's paper in Proc. Zool. Soc. Lond., 1910, p. 38:—

"Very common throughout Katanga and the northern portion of N.E. Rhodesia, west of the Mchinga escarpment. . . . It would seem to be a true Batesian mimic of *Limnas chrysippus*. It usually settles on the ground, and when doing so, temporarily sits with expanded wings showing its *chrysippus*-like coloration. When going to rest, however, it settles with closed wings among dry leaves, and then, owing to its cryptic underside, is extremely inconspicuous."

In view of the natural and proper desire for complete evidence that model and mimic fly together and resemble each other in life, it was right that these observations, noted on the spot when the insects were seen for the first time and would attract the keenest attention, should be recorded in a permanent form.

NOTES ON INSECTS VISITING THE COMMON PRIMROSE.—Prof. POULTON said that Mr. W. H. T. Tams' interesting paper in "The Journal of Botany" (Vol. 60, July 1922, p. 203) had reminded him of some observations made in the spring of

1893 by his dear friend Prof. Raphael Meldola and himself, in the neighbourhood of Peasenhall, Suffolk. The insects observed are well known to visit the primrose: a list of records with full references will be found in Mr. Miller Christy's paper in Journ. Linn. Soc. Bot., xlvi (1922), pp. 105-39. There is, however, so much doubt about the adequacy of these visits to effect sufficient cross-fertilisation that it seems worth while to add a few further observations which were noted down at the time.

"April 8, 1893.—Meldola and I saw a Humble-bee-fly (*Bombylius*) * visiting the primrose on the edge of Coe Wood, near Peasenhall. It visited the flowers one after the other most systematically, plunging its tongue in up to the very base. We watched it closely and carefully. It went from one flower to the other on each plant it visited, and then on to the next plant, etc. We saw it suck quite a dozen flowers, and it *only* sought the primrose.

"April 15, 1893.—With Meldola saw another *Bombylius* visiting the blue flowers of 'ground-ivy,' *Nepeta glechoma* Benth. (*Glechoma hederacea* L.). It went to two or three successively and then disappeared. Near Heavingham: roadside bank.

"Saw also on the same day on a roadside bank, near Lodge Wood entrance, a female *G. rhamni* L., visiting once or twice the flowers of primrose, and the male of *P. napi* L., also visiting them once or twice.

"The *rhamni* was persistently chased by a Pierid (almost certainly a male *P. napi*) for a long time (probably a minute). Then they separated, but twice or three times afterwards when the same two butterflies happened to meet they flew round each other for a second or two only and then separated. It seemed in fact that they recognised each other."

Prof. Poulton said that he had also often seen *Bombylius* visiting the primroses in his garden at St. Helens, Isle of Wight.

Mr. A. H. Hamm had written the following account of his experiences,

* Almost certainly *B. discolor* Mik., possibly *B. major* L.

"For many years past I have frequently observed *Bombylius discolor* and *major* hovering over the flowers of the primrose in the woods near Oxford. Though the latter species is the commoner of the two, the former is more frequently seen visiting this plant. In the University Parks in the spring, *B. major* is often seen, with an occasional *B. discolor*, hovering over the polyanthus blooms. The only definite date I have for *B. discolor* at primrose is April 14, 1906, when I took about a dozen nearly all at the flowers of the primrose in Tubney Wood, near Oxford. I have often seen other small Diptera in the corolla, but have kept no record of the species or group.

"Other insects often seen when the flowers are picked or shaken are *Meligethes* and another small beetle, and sometimes a species of thrips."

Mr. Collins' experience is as follows:—

"I have often seen *Bombylius discolor* Mik., visiting primroses in spring and have noticed that they are fond of resting on dry oak-leaves on the ground when not at the flowers. I have often seen it on Boar's Hill, Tubney, Cothill and other places near Oxford, but always in woods where primroses were plentiful and in flower.

"I have also found the Staphylinid beetle *Eusphalerum primulae* Steph., abundant in primrose flowers, near Oxford. They occur as late as June at Tubney, Wytham and Stowe Wood. The Nitidulid beetle *Meligethes picipes* Sturm., is also plentiful in primrose flowers in spring. I have seen them covered with yellow pollen coming out of the corolla of the flower when it was picked."

Mr. Hamm and Mr. Collins agreed with him in the belief that *Bombylius*, although a visitor to other flowers, sought the primrose far more commonly than any other.

Mr. Miller Christy, in the paper quoted on p. lxxxv, considers the visits of these insects and certain others are insufficient to account for cross-fertilisation, and believes that moths are the probable main agents. It is, however, of importance to inquire how far the primrose is crossed legitimately. The late Prof. Weldon, F.R.S., had told him that when he was teaching at Cooper's Hill and wanted to

show the different forms of flowers to his class he began to collect in the neighbourhood, but could only find primroses of one form.

Is it not probable that fertilisation was often effected locally and illegitimately by means of small beetles, thrips, etc., with limited powers of ranging, and that sufficient legitimate crossing to maintain the strength of the stock is carried on by *Bombylius* and the Lepidoptera with tongues of sufficient length which have been observed to visit the flowers?

In the discussion Mr. A. E. TONGE recorded the fact that he had netted *Cucullia verbasci* L., at primrose bloom when collecting at dusk in April near Chichester.

ABERRATIONS IN PAPILIOS FROM FORMOSA.—Mr. ARTHUR DICKSEE exhibited :—

(1) An example of homoeosis in *Papilio horishanus*, male, from Central Formosa. On the underside of the left fore-wing is an oblong patch, 5 mm. \times 2.5 mm., of the colour and with the rough scales of the underside of the hind-wing. It lies along the middle of nervure 4, and projects forwards half-way across cell 4. It is bright red with a semicircle of black, which is broad internally and anteriorly and becomes very narrow where it touches the nervure on either side. The black part represents the posterior part of the black spot in the middle of cell 4 of the hind-wing, but is not identical in shape with it: in the hind-wing the black does not touch the nervure and is slightly convex posteriorly. The abnormal wing is fully developed, shows no reduction in size, and has a normal upper side and neurulation. Similar examples have been described in *Papilio bianor* (Proc. South Lond. Ent. and N.H. Soc., 1888, pp. 39-40), and *P. glaucolaus* (Berl. Ent. Zeitschr., 1908, liii, pp. 199-201).

(2) An aberration of the male of *P. taiwanus* from Formosa, together with a normal male and female. Instead of the hind-wing being rounded it is of the somewhat square shape of the female, but even more pronounced, and it shows a greater development of a tail.

(3) Twelve specimens of the females of *Agrias amydon* and *A. muzoensis* from Colombia, correcting the statement of Fruhstorfer in Seitz that the female never has any blue mark

on the hind-wing. In the three examples the blue mark is very pronounced; in one it is distinct; in five others it can be seen with the naked eye; in two a magnifying glass is required to detect the blue scales; and only one specimen is without them. Fruhstorfer is also incorrect in stating that the female from Brazil is the only one that has red marks on the hind-wing. In one example there is a very pronounced red mark in the cell, and it can be distinguished in five others.

Papers.

The following papers were read :—

“A revision of the Australian species of the Genus *Melobasis*, Fam. Buprestidae, Order Coleoptera, with notes on allied genera,” by Mr. H. J. CARTER, B.A.

“Description of the pupal shell of *Lachnocnema bibulus*,” by Mr. G. T. BETHUNE-BAKER.

Wednesday, December 6th, 1922.

The Rt. Hon. Lord ROTHSCHILD, F.R.S., etc., President, in the Chair.

Obituary.

The PRESIDENT announced the death of Mr. H. J. ELWES, F.R.S., a former President, and a vote of condolence with his relatives was passed.

Nominations for 1923.

The SECRETARY again read the list of nominations of Officers and Council for the ensuing year, and said that he had not received any alternative names.

Election of Fellows.

The following were elected Fellows of the Society :—Mr. DONALD ALLEN, 21, All Saints Road, King's Heath, Birmingham; Mr. H. L. ANDREWES, c/o John Heelas, Esq., Queen Anne's Mansions, London, S.W.

Gifts to the Society.

The TREASURER called attention to two new portraits in the Meeting Room, and also exhibited the plans for the new Meeting Room which it was proposed to erect at the back of the present building at some future date. These had been drawn up by Mr. W. RAIT-SMITH and presented to the Society. A vote of thanks to him for his generosity in the matter was passed unanimously.

Exhibitions.

A DIPTERON ASSOCIATED WITH ANTS.—MR. DONISTHORPE exhibited a larva and pupa cases of a species of *Microdon* (either *M. latifrons* Lw., or near to it) which he had found in the galleries of *Acanthomyops* (*Donisthorpea*) *niger* L., in stumps of Scots pine in the New Forest on May 6 and 11, 1922; also a pupa case of true *Microdon latifrons* from Woking, larvae and pupa case of *M. mutabilis* from Porlock, and an imago of *M. devius* from near Oxford. He mentioned the British distribution of *M. latifrons*, and also said that Father Wasmann had told him that the pupa cases he had sent to the latter from the New Forest were *M. rhenanus* Andries, a species new to Britain.

A RARE BRITISH TORTRIX.—MR. W. G. SHELDON exhibited three specimens of a rare British Tortrix, *Hedya simplana* F. von R., from Kent. These were the only examples taken or seen by him in a fortnight spent in the locality.

HOMOEOSIS IN BUTTERFLIES.—DR. E. A. COCKAYNE exhibited:—

(1) Two examples of homoeosis in *Coenonympha pamphilus* L., taken by Mr. H. A. Leeds in 1922. The first, a male from Kent, has a number of patches of the tawny colour of the underside of the fore-wing on the underside of the right hind-wing. These patches have scales like those of the fore-wing, and are devoid of hairs. The second, a male from Monk's Wood, Hunts, has areas with the colour, and with the scales and hairs of the underside of the hind-wing on the underside of the right fore-wing. Both have the upperside and neuration normal, and show no sign of injury.

(2) Homoeosis in *Lygris* (*Cidaria*) *prunata* L. This is a male taken at Malvern in 1904 by the Rev. A. Day. On the upperside of the right fore-wing there is a narrow whitish stripe with scales of the same structure and colour of those of the anterior part of the upperside of the hind-wing. It runs through the outer part of the dark basal area, and right across the dark central area of the wing lying in the anterior part of the discoidal cell and along both sides of nervure 6. The underside and neuration are normal, and there is no sign of injury.

(3) *Zygaena trifolii*, male, with symmetrical absence of scales in the interneural spaces of both fore-wings, which gives it a radiated appearance. The red scales of the outer two spots on the fore-wings are deficient in pigment and curled up.

LIMENITIS SIBILLA L., FROM THE NEW FOREST.—Capt. K. J. HAYWARD exhibited an example of *Limenitis sibilla* L., taken by himself in the New Forest, July 11, 1922, having four symmetrical scaleless patches—one on each wing above, at the interior and anal angles respectively.

STRUCTURE OF THE TYMPANIC ORGAN IN NOCTUID MOTHS.—Dr. H. ELTRINGHAM recalled the exhibit by Dr. K. Jordan at a previous meeting of some preparations showing part of the structure of the tympanic organ in Noctuid moths. In these moths the organ was situated in the thorax, but in the Geometers and some other families it was in the abdomen. As the structure was of considerable complication, and difficult to describe at all briefly, he had made a wax model of it, which, though rather roughly constructed, would probably serve to illustrate the structure fairly distinctly to those who cared to examine it. He had not written anything about it at present, as he was hoping to receive from Madagascar some large Uranid moths from which he expected to obtain fuller information in regard to the nerve structure and distribution. Meanwhile he would urge Fellows, when the opportunity occurred, to make a note of any observations that might indicate a sense of hearing in moths.

Dr. JORDAN called attention to the great importance from a systematic point of view of Dr Eltringham's investigation.

THE SCENT-ORGAN OF CERTAIN MIMETIC CASTNIIDAE.—Dr. K. JORDAN exhibited some species of Castniidae which resemble butterflies, and said that these mimetic Castniids fall into two groups, each characterised by certain details in the neurulation and the colouring of both sexes, and by very conspicuous differences in the development of secondary sexual organs in the ♂♂. In the one group (*C. linus*, *C. zagraea*, *C. carilla*, etc.) the paronychium of the midtarsus of the ♂ is enormously enlarged, and there is no abdominal scent-organ. In the other group (*C. melessus*, *C. amazonica*, *C. cyena*, etc.) the first two abdominal sterna of the ♂ have a large scent-organ on each side, which he described in detail. The organ produces a substance which (in the dry specimens) looks like grey or blackish mud and forms a thick coating nearly over the whole ventral and ventrolateral surfaces of the abdomen. The scaling on the innerside of the hindtibia and hindtarsus of these ♂♂ has developed into a pale brush. The paronychium of the midtarsus is not enlarged.

SEXUAL DIMORPHISM AND MIMICRY IN GEOMETRIDS OF THE GENUS *BORDETA* WALK.—Mr. LOUIS B. PROUT, on behalf of Mr. J. J. JOICEY, exhibited species of the *Bordeta lemnia* group, together with their supposed ♀♀, and specimens of *Eucharidema* for comparison, and read the following notes:—

Recent careful examination has convinced me that there is extraordinary sexual dimorphism in the group of "*Bordeta*," of which *lemnia* Bdv. ("Voy. Astrolabe, Fn. Ent. Pacif." i, 207, t. 5, f. 7, 1832) is the longest-known species. This form, not very rare on Amboina, and recently collected (two ♂♂) by the Pratt brothers in Central Ceram at about 3000 ft. altitude, is invariably ♂. A very different-looking insect from the same localities and always ♀, "*Craspedosis* (?)" *bicolorata* Warr. (Nov. Zool. iii, 398), was collected by the Pratts in three examples. The more blurred white markings (as compared with the allies) is a feature common to the two, while "*bicolorata*" retains an orange, black-belted posterior half of the abdomen beneath as a further indication of its ancestry, and close investigation reveals other points of contact with *lemnia*.

B. posticigutta Prout (Bull. Hill Mus. i, (2), 291), from higher

altitudes in Central Ceram (4600-6000 ft.) is evidently a nearly related species to *lemnica*, and is again invariably ♂; the insect, taken at the same altitudes, which (*loc. cit.* 292) I thought must "surely belong" to *Eucharidema apora* Prout, "in spite of remarkable differences in venation," bears so closely the same relation to *posticigutta* as does *bicolorata* to *lemnica* that I have now no hesitation whatever in associating the two pairs, the more so as an aberrant ♀ of *posticigutta*, which I am exhibiting, retains a vestige of the white cell-spot on the fore-wing above and beneath, and some slight suffusion of orange scales on hind-wing beneath.

Further confirmation is just to hand in the arrival of a good series of a new race of *posticigutta* collected by the Pratts on Buru, both sexes differing from the name-type in quite similar directions—reduction or suppression of the white, yellow or orange markings.

Finally, *B. anisochrysa* Prout (Ann. Mag. Nat. Hist. (8), xx, 127, pl. 7, f. 7, Biak, the type unique) shows on the upper-side some general resemblance to the other ♀♀ of the group, while the hind-wing beneath conserves quite the typical colour-scheme of the *B. tricolor* (Warr.) group, being orange with irregular black band and black border.

How, then, did the remarkable sexual dimorphism arise? I do not think it can be doubted that the occurrence of *posticigutta* together with *Eucharidema apora*—which deceived me into taking them for sexes of a single species—furnishes at least a part of the explanation.

In the type of *Eucharidema trichroa* Roths. and Jord. (Deutsch. Ent. Zeit. 1907, p. 197, British New Guinea) the sexes are quite alike. Of *apora*, a race or close ally with greatly reduced red area on hind-wing, the Pratts unfortunately took ♂♂ only (11 in all). The very wide divergence of the ♀♀ above considered from the normal *Bordeta* pattern (which is retained by the ♂♂, as also on the underside of ♀ *anisochrysa*) and their schematic resemblance to *Eucharidema* points to a very fine case of mimicry between diurnal Geometridae, though the nucleus of the mimetic association may have to be sought in some commoner species outside this family. Of *posticigutta* 18 ♂♂ and 18 ♀♀ have been taken.

APPENDIX: DESCRIPTION OF A NEW RACE OF *Bordeta*
posticigutta Prout.

B. posticigutta decosta, subsp. nov.

♂, 46-48 mm. Abdomen dorsally black or at least (perhaps in one-third of the examples) with the black belts considerably broadened. *Fore-wing* almost as variable as in *p. posticigutta*, but with the spots—especially the proximal and the subternal—on an average reduced, the minute one on SM² only present in one example. *Hind-wing* with the black border somewhat narrowed, entirely without the subternal yellow spot. Under-side the same, but the hind-wing showing, in the broadest-bordered aberration, a minute yellow dot close to termen just behind M².

♀, 48-53 mm. *Fore-wing* with the band yellowish-buff in all the known examples (sometimes almost orange, at least beneath), on an average narrower than in the other race, the fork to hind margin always obsolete or greatly reduced and broken—often indicated by a small dot on SM², similar to that of the ♂-ab. mentioned above. *Hind-wing* with the orange subternal band generally reduced, though variable.

BURU: Gamoe M'apat, Central West Buru, 5000 ft., April-May 1922 (C., F. and J. Pratt), a good series in coll. Joicey. Also several from Kako Tagalago, Central Buru, 2700 ft., May 1922.

In connection with this exhibit Mr. TALBOT made the following remarks:—

Certain forms of Agaristidae may serve as models or constitute the centre of an orange-and-white association. In Dutch New Guinea the *Eucharidema trichroa* has somewhat similar markings to a form of the commoner Agaristid, *Immetalia saturata longipalpis* Kirsch. In Ceram the *Eucharidema* follows *Immetalia saturata* Walk., form *leucomelas* Jord., which, however, is less common than *Ophthalmis privata* Walk., a species in which the white band is more distal. In Buru the *Bordeta* has a pale orange band and may be associated with *Immetalia saturata* Walk., in which the ♀ has a pale orange band.

Eucharidema, with its sharply defined bands, is perhaps the older mimic of the Agaristid and the *Bordeta* ♀, with its dyslegic bands, a more recent development in association with the *Eucharidema*. The two allied Geometrid genera

have most likely similar habits, and resemblances would more easily be developed between them than between either of them and an *Agaristid*. The production of a dimorphic ♀ in the *Bordeta* seems to indicate long and close association with the form (*Eucharidema*) which we see resembles it. If the mimetic interpretation is in any way correct, we can prophesy that an *Eucharidema* with an orange band on the fore-wing will be discovered in Buru.

RARE BRITISH LEPIDOPTERA.—Mr. J. H. DURRANT exhibited :—

Eucosma (*Crociosema*) *plebeiana* Z., (*Tortricidae*), Street, S. Devon, 10. x. 1900 (*E. R. Bankes*)—New to Britain.

Cataplectica farreni Wlsm., Ashton Wold, Oundle, Northants, 11. vii. 1922 (*Hon. N. C. Rothschild*)—a new locality—hitherto only taken at Cambridge and King's Lynn.

Hipocrita jacobaeae L., var., Woodchester, E. Gloucester, 15. v. 1920 (*L. Lacey*)—a curious pale, slate-grey specimen.

Plusia pulchrina Hw., ab., Rodborough, Gloucester, 1. vii. 1919 (*L. Lacey*)—with a large triangular space on both fore-wings devoid of scales.

Sterrhia dimidiata Hfn., var., Rodborough, Gloucester, 20. viii. 1922 (*L. Lacey*).

FURTHER EXAMPLES OF *HEODES PHLAEAS ETHIOPICA* FROM S.W. UGANDA.—Dr. ELTRINGHAM showed eleven specimens, all males, of this geographical race of *H. phlaeas* L., recently sent to Prof. Poulton by Dr. G. D. H. Carpenter. All had been taken at 6000–7000 ft., in Rukiga County, Kigezi District, in the extreme S.W. corner of Uganda, on the floor or along the E. border of the Western Rift Valley. Dr. Carpenter had visited this area in 1916, and his description of it was published in *Proc. Ent. Soc.* for that year, pp. cxv–cxxxii. The exhibited specimens were taken as follows :—

August 22, 1922.—Near Kabale, about 6000 ft.—2.

August 30, 1922.—Lake Bunyoni, about 6600 ft.—1.

September 7, 1922.—Chahafi: a marsh on the E. side of the floor of the Western Rift Valley, about 6500 ft.—1.

September 8, 1922.—At the foot of the E. escarpment of the Rift Valley, near Chahafi: “very localised in one patch”—7.

All the specimens resembled those previously taken by Dr.

Carpenter and Mr. T. A. Barns, the black spot at the anal angle of the fore-wing being concave towards the base of the wing; the blue spots distinct on the hind-wing except in one much-worn example; the inner border of the red marginal band of the hind-wing scalloped. The left fore-wing was pale in one of the seven specimens taken on September 8, an appearance well known in *phlaeas phlaeas* L., of the Northern Belt, and, whether due to inherent variation or to a response to external conditions, emphasising the close affinity between these two geographical races.

DELAYED DEVELOPMENT IN AN INBRED LARVA OF *ABRAXAS GROSSULARIATA*.—Dr. ELTRINGHAM communicated for Prof. Poulton the information that the larva exhibited on October 18, 1922, was alive on November 18, but dead a week later. Prof. Poulton wished to correct an unfortunate error in his previous account. This caterpillar did not belong to the Isle of Wight stock, but was descended, inbred, from a wild pair taken *in coitu* at Oxford in 1920 by Mr. A. H. Hamm.

E. AFRICAN LYCAENIDAE SHOWING THE ATTACKS OF LIZARDS.

—Dr. ELTRINGHAM showed the specimens figured by Dr. V. G. L. van Someren in his paper in Journ. E. Afr. and Uganda Nat. Hist. Soc., No. 17, Mar. 1922, p. 18, and referred to by Prof. Poulton in Proc. Ent. Soc., 1922, pp. xlix-li, and said that the material exhibited can be studied by naturalists in the Hope Department, Oxford University Museum.

Dr. VAN SOMEREN made some remarks on the significance of the above specimens, captured by him.

BUTTERFLIES FROM VENEZUELA.—Mr. W. J. KAYE exhibited a large number of specimens representing the members of the principal Müllerian (Ithomiine, Heliconine, Nymphaline) group from the San Esteban Valley near Puerto Cabello, N.W. Venezuela. The whole of the specimens had been taken by the exhibitor between December 19 and 27, 1920. "The path along which they were found flying or settled runs alongside a broad rocky stream. The San Esteban Valley varies greatly in width, but on either side the slopes rise to about 2000 ft. They are wooded to their summits, but there is some cultivation with clearances near to the village of San Esteban, but as one goes further up the valley cultivation disappears. Practi-

cally all the specimens shown were taken along a two-mile stretch of path, and about half of them in one particular favourite haunt. Practically all were caught flying, there being little or no plants in flower except for a plant or two of *Eupatorium odoratum* (Christmas Bush) near some habitations. These plants were evidently past their full attractiveness, as the only butterflies on them were two ♂ *Perrhybris malenka*." The species represented were :—

DANAIDAE.	(3) <i>Eueides vibilia</i> .
LYCOREINAE.	(2) <i>Eueides isabella kubneri</i> .
(1) <i>Lycorea ceres atergalis</i> .	NYPHALIDAE.
ITHOMIINAE.	(1) <i>Eresia eunice</i> .
(10) <i>Hirsutis furia</i> .	(5) <i>Eresia carme</i> .
(20) <i>Mechanitis polymnia doryssus</i> .	(4) <i>Protopogonius hippona lilops</i> .
(16) <i>Ceratinia fraterna</i> .	PIERIDAE.
(7) <i>Ceratinia euclea</i> .	(9) <i>Dismorphia amphione astynomides</i> .
(6) <i>Ithomia iphianassa</i> .	(1) ♀ <i>Dismorphia theucharila</i> .
(15) <i>Epithomia alphi</i> .	(2) ♂ <i>Mylothris malenka</i> .
(2) <i>Hypoleria ocalea</i> .	
(1) <i>Athesis clearista</i> .	
HELICONIDAE.	HYPSIDAE.
(14) <i>Heliconius aulicus</i> .	(3) <i>Pericopis angulosa</i> .
(1) <i>Heliconius anderida estebana</i> .	(1) <i>Pericopis philithomia</i> , sp. n.

"The numbers in brackets are the numbers actually caught. In some cases many more specimens might have been taken. *Mechanitis polymnia doryssus*, *Epithomia alphi*, *Ceratinia euclea* and *C. fraterna* were all common, and it is significant that all these are of the unpalatable subfamily Ithomiinae.

"Most curiously only one specimen of *Lycorea ceres atergalis* was seen or taken. No doubt *H. anderida estebana* would accompany the *Lycorea*, as in appearance these two would be the closest in pattern and colouring, while the *Protopogonius* would certainly be the next closest. The *Lycorea* and *Protopogonius* fly in much the same way, and when fluttering near

a flowering bush, as I found at Caracas, are very difficult to determine at a short distance away. In flight the tails of the *Protophonus* are only noticeable when it is sailing along with outstretched wings above one's head. When fluttering near the ground the resemblance to *Lycorea* is remarkable.

"It is difficult to know where to say the group as a whole ends and what species to include. Objection might be taken to including *Hypoleria ocalea*, but it can easily be mistaken for *Epithomia alphi* on the wing. While in the other direction it links up the more transparent smaller Ithomiine species such as *Pteronymia agalla*, of which four were taken, *Heterosais giulia*, one only of which was taken, and *Episcada sylpha*, which as usual was quite common. These three last species are really properly speaking mountain butterflies, occurring much more commonly at 3000 ft. At 500 ft., the elevation at which the specimens exhibited were caught, many really mountain species occasionally put in an appearance. It is possible, for instance, to take *Olyras crathis* where I was collecting, as I saw a pinned specimen in the hut of an old man who years ago collected for Staudinger. Most probably also *Eutresis hyperia* can also be taken occasionally.

"The total absence of any *Melinaea* was noteworthy as it left *Heliconius aulicus* without any very close mimetic connection. *Melinaea lilis* is found at Caracas at 3000 ft., and it was specially noted at San Esteban that there were no *Melinaea* species to be obtained. *Heliconius aulicus* never flew before 11 a.m., and only if there was strong sunshine. Its flight was usually in long sweeps, and occasionally it would ascend quite fifty feet in height. The actual numbers taken must be looked upon as rather out of proportion to all the other species of the group, as a special effort was made to secure a series of this exceedingly local and usually rare insect. A second *Heliconius* species that occurs on the same ground and which also belongs to the large association is *Heliconius anderida estebana*. The species was apparently only just beginning to appear, as two fine specimens were seen but not taken. A very old and worn specimen was, however, secured, making the identification certain. The race *estebana* varies to the race *clara*, and a most varied series was obtained by

Mr. Klages a number of years ago, a series of which is here shown. No doubt *H. a. estebana* greatly resembles *Protopogonius hippona lilops* on the wing, as I noted in Trinidad that the *Heliconius* there, *H. numata ethilla*, flew with and greatly resembled while in flight *Protopogonius hippona ochraceus*. While watching these flights a most interesting fact was noted. The *Protopogonius* was observed, while sailing along overhead, to present the upperside colouring. Earlier in Venezuela I noted the same phenomenon with *lilops* at San Esteban, and have since proved that how this happens is that the cryptic colouring of the underside is composed of partly transparent scaling which is also set more openly instead of very closely as on the upperside. The result is that the colouring of the upperside against the light shows through, and thus on the wing the Ithomiine appearance is complete when viewed from above or beneath.

"The story of how I discovered that *Protopogonius* was transparent is as follows. In November 1920 I was in Trinidad, and while collecting on one of the hillsides above St. Ann's Valley, I saw *Protopogonius ochraceus* below me sailing about with outstretched wings. The inference was then made that if one was below instead of above one would see the dead leaf-like underside. In December I visited Venezuela and in the San Esteban Valley I noted that *Protopogonius lilops* flying along in front of me exhibited the upper side. Several specimens of this species were subsequently caught but always fluttering near the ground and no more was thought of the incident. In late December a return was made to Trinidad and on January 1st, 1921, when walking along the Ariapita Road in St. Ann's Valley a number of *Protopogonius ochraceus* were observed from below while floating around a tall bush of from 12-15 ft. These specimens very clearly showed the upperside colouring, and the thought came that these butterflies were flying upside-down. At the end of the month I left for England and forgot the incident of the upside-down *Protopogonius* until just recently, when I was arranging the mimetic groups for exhibition, the recollection of the *Protopogonius* again came to mind. I then held specimens over my head to try and understand how it was I saw the uppersides

from below. The problem was solved immediately as it was at once plain that the upperside colouring showed through the underside.

"Of the other two Nymphalines *Eresia eunice* and *Eresia carne*, the former, flying with *Ithomia iphianassa* and *Ceratinia euclea*, was entirely unsuspected of its identity till in the net; while *E. carne* ♀ was suspected of being a *Eueides vibilia* ♀. It is curious there is nearly always an *Eresia* or two present in these mimetic associations, but they are usually very imperfectly protected as the resemblance is more often only of a general nature.

"The Pierines protected in the association consisted of two *Dismorphia* and a *Perrybris*. The mimicry of the ♀ *Dismorphia amphione astynomides* to *Mechanitis polymnia doryssus* was of the closest. Of nine specimens of the *Dismorphia* taken, only one was a male while eight were females. The male is not nearly so good a mimic as the female, as besides a slightly different colour its shape does not harmonise with the narrow-winged *Mechanitis*. In every case *D. astynomides* was taken amongst *Mechanitis*. I well remember a bank where *Mechanitis doryssus* was flying and where nothing else was detected but four female *Dismorphia astynomides* flying amongst them. The single *Dismorphia theucharila* ♀ was noticed at once as being something fresh. It was flying slowly alone, but close to where *Ceratinia euclea* had been observed and taken. *Perrybris malenka* was only secured in the male sex. Two females were also seen, but as has been observed by Bates and others their fondness for the underwood prevented captures being made. Both sexes, however, come freely out in the open to Christmas Bush (*Eupatorium odoratum*) as I found in Trinidad, but the attractiveness of the plant at Esteban was passing. Both the males were taken off this plant, however. Off another *Eupatorium* bush some distance away three *Pericopsis angulosa* were observed and taken at different times. These Hypsid moths were all sitting with wings erect over the back in true butterfly fashion. The general resemblance to a *Heliconius* species when in this position is striking. No other species of any kind was ever seen sitting with these *P. angulosa*. Half a mile away a second species of *Pericopsis*

(which turns out to be new and is described below) was observed. It was at rest on the upperside of a leaf with wings flat and partly drawn back. It was beaten into the net, and was sluggish as the weather was dull. No other specimen was seen, and neither *P. angulosa* nor the present species was seen on the wing.

"The whole set of insects taken during the week is especially interesting from its rather unusual composition, *Heliconius aulicus* being present in some numbers, and having no very real support from any very similar Ithomiine. *Hirsutis furia* certainly never gave a suggestion that it might be a *Heliconius aulicus*. Probably at different periods of the year the composition of the group varies greatly, as I found it did over a long series of collections made in central British Guiana. But the Ithomiine models of the Heliconines were there never absent. In the case of *Heliconius anderida estebana*, which was practically absent at San Esteban, it was interesting that *Lycorea ceres atergatis* was also practically absent contemporaneously, as these two are probably in close association with the *Protozonius*. The most perfectly protected mimic was undoubtedly the Pierine, *Dismorphia a. astynomides*, as its associated Ithomiine models outnumbered it by at least ten and perhaps twenty times, while the detailed resemblance to two of the models, *Ceratinia fraterna* and *Mechanitis p. doryssus*, made detection on the wing only possible with close scrutiny.

"It remains to be said that lizards were observed in the greatest abundance, especially on the bank before mentioned, where the Ithomiines were mixed up with *Dismorphia a. astynomides*."

Pericopsis philithomia, n. sp.

Intermediate between *Pericopsis isse* and *Pericopsis ithomia*.

Fore-wing very dark greyish brown with a slightly paler longitudinal shade below the median nervure. A pale yellow transverse median band from costa to tornus, and a parallel broad pale yellow subapical band. A marginal series of whitish spots from apex to tornus. Hind-wing pale reddish orange, with the discocellulars heavily marked. A broad marginal band composed of oblong black spots or wedge-shaped marks. Just before the margin the ground-colour of the wing shows

through the intervening spaces. Fore-wing below as above except that the basal area is orange, a patch of the same colour entering the cell. Inner margin greyish black. Hind-wing below as above except that the marginal interspaces are whitish and not orange. Exp. 65 mm.

Hab. VENEZUELA: San Esteban Valley, 23.xii.20 (W. J. Kaye).

THE FOOD PREFERENCES OF *VESPA VULGARIS*.—Mr. W. J. LUCAS said:—

"On November 13, 1922, my attention was taken by a large number of flies sunning themselves on an oak fence facing south along the boundary of Esher Common in Surrey. Most were large—blow-flies or their like—but some were smaller. While watching I noticed a wasp hunting on the wing over the surface of the fence, evidently in pursuit of the flies, which it often approached (though it sometimes made for the nails in mistake!). At length the wasp pounced on one of the smaller flies—a metallic blue-green one—and went down to the ground with it, where I sought and found it at once. It had, however, released the fly and caught a small spider, having made a very rapid change. Both victims were paralysed, but the fly was not quite dead though the spider appeared to be so. The three specimens were given to Prof. Poulton for the Predaceous Insect Series he is forming in Oxford. He considers this to be a very pretty case of preference in the matter of prey. Such things are rarely met with, although they must always be occurring in Nature. A. H. Hamm identifies the wasp as a worker of *Vespa vulgaris* L. and the fly as a male of *Euphoria cornicina* F.; Dr. A. Randell Jackson says the spider is a ♀ of *Meta segmentata* Clerck, an orb-weaver, probably not quite mature."

VARIETIES OF BRITISH LEPIDOPTERA.—Mr. L. W. NEWMAN exhibited a long and very varied series of *Lycaena thetis* both upper and undersides including fine striated and *obsoleta* forms and colour variations in the male, all taken at Folkestone September and October 1922. Also for comparison a series of 1921 specimens, the undersides of which instead of being the usual steel-grey have all a distinct reddish colour, which clearly points to the fact that weather conditions have a considerable effect upon the undersides of this species. Also long and varied

series of *Melitaea aethalia* from Kent, being picked specimens to show range of variation from extremely light to dark forms; a series of *Melitaea aurinia* from English, Irish and Welsh localities; and a series of bred *Zylena semibrunnea*, from Oundle, Northants.

NEW AND LITTLE-KNOWN BUTTERFLIES FROM THE ISLAND OF BURU.—Mr. G. TALBOT, on behalf of Mr. J. J. JOICEY, said that the brothers Pratt had collected on Buru for Mr. Joicey from January to May 1922, and had succeeded in making a very fine collection of Lepidoptera. Collections were made on the south coast at Lek Soela and in the mountains in the south-west district at elevations of from 2700–6000 ft.

The principal discovery was a new *Troides*, which has been described in the "Bulletin of The Hill Museum," vol. 1, pt. 2, under the name of *T. prattorum* J. & T. Its habitat was found to be very limited in extent, and perhaps for this reason the species remained undiscovered by Dutch collectors who have been all over the Island.

A remarkable aberration of the ♂ of *prattorum* was obtained at the coast between February and March, but there is some doubt as to this locality. This specimen presents some of the characters of *T. helena bouruensis* Wall., with a preponderance of the characters of *T. prattorum*. The fore-wing is shaped like *prattorum*, but with faint vein stripes. The hind-wing is more like *bouruensis*, especially in the form of the cell and in general markings; there is, however, a distinct but slight opalescence on both sides. Whether we have to do with an aberration showing reversion to a primitive type or with a hybrid, is a question we cannot answer. Aberrations are more numerous than hybrids, and it may be more reasonable to suppose that this specimen represents some ancestral type.

Troides helena bouruensis Wall.—Three pairs are exhibited to show the variation in both sexes.

Papilio ulysses ampelius Roths.—The most westerly race of this species, hitherto only known by one ♂. The ♂ and ♀ are shown. Found at the coast and in Central Buru.

Dichorhagia ninus, subsp. nov.—This form is shown in comparison with typical *ninus* Feld., from Ceram. Obtained up to 2700 ft.

D. ninus Feld.—From Ceram, with the hitherto unknown pupa. This pupa shows the Apaturid affinity of the genus, but is remarkable for the possession of three lobes on the back of the thoracic area.

Charaxes madensis Roths.—A few specimens of this species were obtained, including the unknown ♂. This species, on account of the ♀ markings presenting a resemblance to the ♀ of *C. mars*, has been associated with that species. Now that the ♂ is known, it is seen that the relationship to *mars* is only a remote one, and this species must still be said to be confined to Celebes. We believe that *madensis* is more nearly related to *C. euryalus* Cram., from Ceram, an opinion formed by a close comparison of the markings and from the general prevalence of Ceram forms in Buru. This is the only *Charaxes* in which, the sexes being dimorphic, the female possesses a white band which also occurs in the male. The species was obtained at from 2000–3500 ft., both at the coast and in the central part of the island.

Mynes dohertyi Holl. ♂♀.

Delias.—Messrs. Pratt collected five new species of this genus. One example proved to be the ♂ of *D. vidua* J. & T., already described in the "Bulletin of The Hill Museum," vol. 1, pt. 2. The species bears a remarkable resemblance to *D. isse echo* Wall., also from Buru, and of which a series was obtained. Whilst *D. echo* has Moluccan affinities, *D. vidua* has much in common with *D. caliban* Sm., from British New Guinea. We exhibit two other parallel cases of resemblance between species of this genus:—

(a) *D. subviridis* J. & T., and *D. echidna* Hew., from Ceram. These belong to different groups.

(b) *D. rothschildi* Holl., and a new species, both from Buru. The new form is wonderfully like *D. rothschildi* on both surfaces. It appears to have affinity with *D. dohertyi* Roths., from Timor; this name must, however, sink to *D. dohertyi* Ob., for another species. The Timor form is associated with a similarly coloured *Huphina* as pointed out by Dr. Dixey in Trans. Ent. Soc. 1920, p. 208. A similar *Huphina* has not been found on Buru as yet. Both *Delias* were obtained at the same elevation.

A third new form from Buru is related to *D. joiceyi* Talb., from Ceram. It occurs at 5000 ft., a higher elevation than most of the others.

A fourth novelty represents the Ceram *D. manuselensis* Talb., and the fifth represents the Ceram *D. stresmanni* Roths. All these are quite distinct from their Ceram relatives.

D. funerea buruana Roths., is shown. This species recalls *D. duris* Hew., from Ceram and is doubtless related to it. The female of *D. buruana* presents a close resemblance on the upper-side to both sexes, especially to the female, of *Mynes doherityi*. On the underside the red basal streak of the hind-wing is common to both. These mimics occurred at the same place.

The exhibitor said that descriptions of the new forms exhibited were being prepared for early publication.

CURIOUS NEMOPTERID LARVA.—Dr. H. ELTRINGHAM showed on the screen a drawing of the curious Nemopterid larva which had been brought to the Hope Department by Mr. Willmer and exhibited alive by Prof. Poulton at a previous meeting. He gave some account of its structure, and said that a fuller description with notes thereon kindly supplied by Mr. C. L. Withycombe was in course of preparation.

Mr. C. L. WITHYCOMBE made some remarks on the anatomy of Nemopterid larvae and said that he thought the one in question was possibly a species of *Nemoptera*.

Mr. E. N. WILLMER said the insects were quite common in Egypt in the desert oases and regretted that he had not collected more of them, but he had not at the time realised their rarity.

SCENT-ORGANS IN NEW ZEALAND TRICHOPTERA.—Mr. MARTIN E. MOSELY, who illustrated his remarks with lantern slides, said :—

Amongst a small collection of Trichoptera, sent to me by an angling friend from New Zealand, I noticed in two genera unusual characters which suggested the presence of scent-organs.

Both these genera, *Pycnocentria* and *Olinga*, belong to the Sericostomatidae, a family in which the maxillary palpi of the male are noted for extreme variation from the typical form. They were both described as early as 1860-70, and have been figured by MacLachlan, Ulmer and others. As, however,

these special characters appear to have escaped notice entirely, it is desirable to record them now.

Of the genus *Pycnocentria* there were two species, *P. evecta* McL., and *P. aureola* McL., in the collection, and scent-filaments are present in each. In *P. aureola* the form of the filaments is somewhat obscure, and in no examples were they sufficiently extended to enable me to take a satisfactory photograph. Treatment with caustic potash rendered the filaments invisible. I have been unable with the limited amount of material at my disposal to obtain any very clear idea as to their form and origin. In appearance they are small, somewhat shapeless and white, and protrude from each side of the maxillary palpi.

In *P. evecta* the filaments which have a slight purple tinge are more decided in their outline, and the containing walls are hard enough to withstand the action of potash. They seem to originate between and level with the centre of the oculi. When not in use they are retracted and lie across the face inclining towards each other, and are then covered not only by the upturned maxillary palpi, but also by a special quadrangular plate, which is hinged along the lower edge and is lined with stout hairs. There is a short branch towards the base of each filament, and still further towards the base is a group of stout hairs.

The filaments are elastic even after death. They can be extended to a considerable length with the point of a needle, contracting again when the needle is removed, and, although they show a certain resemblance to the filaments in *Hydroptila sparsa* Curt., they are clearly extensile and not eversile as in this species.

In addition to these two filaments another filament is found at the base of each anterior wing, and in contrast to the head filaments is covered all over with fine hairs. It is withdrawn when not in use into a sheath, formed by a fold in the wing membrane. Similar filaments occur in *P. aureola*.

No trace of androconia could be found on the head, though there are scale-like hairs on portions of the anterior wings. The filaments occur in the male sex only, and in the females the hairs of the wings are normal.

The other insect calling for notice is *Olinga feredayi* McL. In this species the supposed scent-organ consists of thickly clustering and specialised hairs arising from membranous processes which form two rosettes in front of the face. These processes can be detached easily with a needle, and do not form part of the containing walls of the head. It is not impossible that they may be capable of extension into hair-covered filaments, but no example received showed this extension. The rosettes occur in the male sex only, and in this sex also there are scale-like hairs on particular areas of the wings.

ANNUAL MEETING.

Wednesday, January 17th, 1923.

Professor E. B. POULTON, M.A., D.Sc., F.R.S., etc., Vice-President, in the Chair.

Dr. S. A. NEAVE, one of the Secretaries, read the following

Report of the Council.

It is with great satisfaction that the Council is able to report a steady and most satisfactory progress in all phases of the Society's activities during the year under review.

The highly satisfactory financial position will be explained to you in detail by the TREASURER, to whom the thanks both of the Council and of the Society as a whole are due for his unremitting care of its interests.

The losses in Fellows by death have again been heavy, the number being 16, one less than last year, but there have been only 15 resignations, as compared with 20, and an even larger number of new Fellows, 54, as compared with 51, has been elected. The Society now consists of 12 Honorary, 1 Special Life, and 688 Ordinary Fellows, making a total of 701, the largest number in its history.

The Society's Transactions and Proceedings will be of about the same bulk as last year, but are much more fully illustrated. The volume of Transactions will consist of 594 pages, and comprises 20 papers by the following authors :—

C. P. ALEXANDER; H. E. ANDREWES; G. J. ARROW; G. T. BETHUNE-BAKER; G. C. CHAMPION; E. A. COCKAYNE, M.A., M.D., F.R.C.P.; H. ELTRINGHAM, M.A., D.Sc.; E. FLEUTIAUX; A. J. T. JANSE; H. MACE; G. A. K. MARSHALL, C.M.G., D.Sc.; E. MEYRICK, F.R.S.; M. E. MOSELY; N. D. RILEY; R. J. TILLYARD, M.A., D.Sc.; B. P. UVAROV (2); J. WATERSTON, D.Sc. (2); and C. L. WITHERCOMBE. Of these, 8 deal with

Lepidoptera, 5 with Coleoptera, 2 with Orthoptera, and 1 each with Diptera, Siphonaptera, Trichoptera, Neuroptera and Mallophaga.

The volume is illustrated by 43 plates, of which 4 are in colour, 26 half-tone, 10 line-block, 2 collotype and 1 lithograph. The originals have in all cases been provided by the authors, and substantial contributions toward the cost of the plates in their papers have been made by Mr. Bethune-Baker, Dr. Cockayne, Mr. Meyrick and Mr. Withycombe.

The Proceedings will consist of about 100 pages and are illustrated by 2 half-tone plates.

The meetings have been very well attended, and numerous exhibits of great interest have been made. At the last meeting on December 6th no less than 15, all of a high standard, were shown.

The detailed work of the business of the Society has been carried on by the Finance and House Committee, the Publication Committee and the Library Committee, and the thanks of the Council are due to the Fellows serving on them for the assistance they have rendered. It has recently been decided that two members of each of these Committees shall retire annually, and not be eligible for re-election for one year, with the proviso that in the case of the Finance Committee, technical members, such as the Society's Solicitor and Surveyor, shall be immediately eligible for re-election.

The LIBRARIAN reports that increasing use has been made of the Library for reference, and that a greater number of books and separata has been borrowed during the year. Several hundred volumes including journals not hitherto in the Library have been purchased, and there have been considerable donations of separata from the late Mr. Rowland-Brown, the late Mr. Hamilton Druce, Mr. H. Donisthorpe, Dr. Imms, the Rev. F. D. Morice and others, besides the normal current periodicals received by exchange and purchase. An important purchase of valuable books from the Library of the late Dr. Chapman was made during the year, and an endeavour is being made to obtain complete sets of journals in which the Library is deficient.

The Bookcases generously presented by the Misses Chapman

have been placed in the Council Room, and will be most useful for storing some of the more valuable books.

On the unanimous recommendation of the Library Committee the Council has decided that the preparation of a new Catalogue of the Library, which has been urgently required for some time, shall be undertaken almost immediately. This will take the form of a Card Index Catalogue, and a sum of £50 will be allocated for the purpose during the year 1923.

The LIBRARIAN wishes to call the attention of Fellows to the Suggestion Book lying on the Library Table, and also to a note-book in the office, which he has compiled, containing a reference summary of the contents of "*Genera Insectorum*," and of Oberthür's "*Lepidoptères comparée*" and "*Études*."

The Council desires to draw the attention of Fellows to the great benefit that would be conferred on the Society by the creation of a Special Fund, by bequest or otherwise, the interest from which would provide a medal in the gift of the Council. Such a medal could be awarded for distinguished services to Entomology or to some special branch thereof, according to the wish of the donor.

The Report was adopted on the motion of Mr. G. T. BETHUNE-BAKER, seconded by Commander J. J. WALKER.

The Treasurer's Report.

The TREASURER then read the following Report:—

It is with much pleasure that I am able to report to the Society that the prosperity, which was apparent a year ago, has been sustained, and indeed substantially increased, during 1922.

The finances affecting the Society's "Home" being at present perhaps of the most interest, I will deal with these first.

The Housing Fund was increased during the year by no less than £1272 7s. 1d. The amounts available for this fund during the past year include a splendid gift of £500 from the MRS. CHAPMAN in memory of their brother, the late Dr. T. A. CHAPMAN, F.R.S. A bequest was made by the late Mr. G. A. J. ROTHNEY of £150; Mr. R. ADKIN again very generously

cancelled his Debentures amounting to £70 drawn for repayment in September last, and Mr. W. H. B. FLETCHER gave a donation of £25. The Society has been able to contribute to this fund from its General Fund the large sum of £333. This was made up of £200 to be allotted annually for this purpose, and the surplus of the amount received for rents in 1921 over the interest paid on Debentures, which, after allowing an amount to provide for the cost of repairs to the premises, amounted to £133.

The amount of Debentures outstanding at the end of 1921 was £4640. Of this £100 was repaid on February 1st last, and a further sum of £815 on September 30th last, making a reduction during the year of £915, and leaving the outstanding amount of £3725. Moreover, as the amount to the credit of the Housing Fund on December 31st was £695 18s. 8d., this sum with amounts to be allotted from the Society's General Fund in 1923 make it apparent that I shall be able to repay Debentures of at least the value of £1000 during the present year.

The income arising out of rents received has exceeded the Debenture Interest and the cost of repairs to premises during the year by £152 14s. 7d.

As the periodical decorative repairs to 41, Queen's Gate will only require to be carried out at intervals of several years, it has been necessary to accumulate a fund to pay for them as and when they occur. The sum of £50 has been taken from the 1921 surplus, and £70 has been allotted for 1922, making the amount standing at present to this fund £120, less the sum of £29 8s. 1d. spent on repairs in 1922.

In addition to the Bequest alluded to from the late Mr. ROTHNEY, the Society has received an announcement that a very handsome Bequest of £1000 has been made by the late Mr. HAMILTON H. C. DRUCE. The income arising out of this bequest is to be applied to the purchase of books for the Library. Two handsome bookcases have been given to the Society by the Misses Chapman.

Turning now to the General Income of the Society, I am able to report that it is satisfactory in all respects, and in some most satisfactory.

The most startling increase arises out of the sale of the Publications. For many years previous to the Society entering into its new "Home" the amount received from this source ranged from £120 to £150 per annum. In 1921, the first year under the new conditions, it reached £181 11s. 3d. Last year the sales of Publications amounted to no less than £335 17s. 8d., more than double the amount received under the old conditions.

It will be asked how this really wonderful result has been obtained; no doubt from several causes, amongst which I should place the following:—

(1) The undoubted increased prestige the Society has attained. I feel sure that this is the main cause; the world judges a Society just as it judges an individual, by its prosperity, its enterprise, and its methods of carrying out the purposes for which it exists.

(2) The Society has now for the first time a staff and organisation competent to deal with the distribution of its Publications.

(3) Until recently we employed a firm of publishers to sell the greater part of our Publications, paying them a large commission for their services; moreover we allowed publishers and booksellers who purchased our Publications, for sale from us direct, a discount considerably more than was usual. The Council now realises that as it is its own Publisher, it does not require an agent to sell its Publications, because anyone desiring to purchase them must come to it. The discounts now given to the "Trade" are those that are usually allowed, and not the previous too generous allowance.

The amount received for subscriptions for 1922 increased by £22 0s. 6d. and reached the large sum of £1169 8s. 0d. Admission fees increased by £22 11s. 0d.

One result in connection with the subscriptions was particularly gratifying to myself, and I am sure equally so to the Council. It is the unfortunate duty of the Council to have to remove at the end of each year in accordance with the By-laws those Fellows who have defaulted in the payment of their subscriptions. In the last ten years the average annual number of these unfortunates has been six. This year I am

glad to say it has not been necessary to remove a single Fellow.

Dealing now with the Society's payments. The Publications have cost £74† 1s. 10*d.*, an increase of over £200 on the expenditure during the previous year, and the largest amount ever devoted to this purpose. The expenditure on the Library has been £184 1s. 11*d.* as against £95 0s. 9*d.* in 1921.

In spite of these increases and the amount transferred to the Housing Fund, and after making a liberal allowance for outstanding liabilities, the income has exceeded the expenditure by the sum of £138 3s. 8*d.*

The net assets of the Society exclusive of the Library (which is valued by me at £5000) has increased from £3563 12s. 2*d.* to £5136 14s. 1*d.*, an increase of £1573 1s. 11*d.*

The amount of Donations in aid of the Publications was £35 11s. 8*d.* I am glad to be able to report a considerable reduction in the cost of Publishing during the past year, and that further reductions are probable during 1923.

In furtherance of the idea embodied in my report a year ago—that the Society should carefully consider its requirements well ahead of the present time—it was decided by the Council that plans should be prepared showing the possible extra accommodation obtainable by developing the rear portion of 41, Queen's Gate, and the area embodied in the present garage at No. 15, Elvaston Mews. Our Fellow Mr. W. RAIT-SMITH has very generously placed his services at the disposal of the Society, and has prepared plans which are at this moment hung on the walls of the Hall. A study of these will show that a very good Meeting Room, about 45 feet long, 25 feet wide, and 17 feet high, can be obtained, capable of seating about 200 persons; in addition this room would provide wall space for a very large number of books. Ample cloak room and lavatory accommodation can also be obtained, whilst the present rooms over the garage would be available and would furnish much more convenient accommodation for the caretaker than that at present available for him on the fifth floor of the house.

This additional accommodation can be obtained with comparatively little structural alteration to the premises, and

moreover it would not involve any infringement of the light and air of the adjoining property.

An estimate of the cost has not been obtained, but it would not be heavy, and the advantages accruing would be great. I feel very strongly that the Society should make every possible effort to be in a position to make these extensions to its premises when the period of the lease of No. 15, Elvaston Mews expires in 1928.

We are all deeply indebted to Mr. RAIT-SMITH for the services he has so generously given and for the skilful way in which he has developed his plans.

Portraits of the following distinguished Fellows have been procured and hung in the Meeting Room:—Lord AVEBURY, Dr. T. A. CHAPMAN, J. W. DUNNING, F. D. GODMAN, Dr. G. B. LONGSTAFF, ROLAND TRIMEN, G. R. WATERHOUSE, Professor J. O. WESTWOOD and G. H. VERRALL; others will be added to the Portrait Gallery during the present year.

There are quite a number of distinguished Fellows who are no longer with us whose portraits we unfortunately do not possess, including the following:—J. G. CHILDREN, R. McLACHLAN, F. P. PASCOE and J. F. STEPHENS. I should be greatly obliged to any Fellow who can inform me how a portrait of any of them can be obtained, or the names and addresses of the living representatives of their families.

The foregoing facts and figures will I trust be held to justify the optimistic forecast I made a year ago as to the Society's prospects and prosperity. I trust, and I am confident, that a year hence, if I am here, it will be my privilege and pleasure to report that the advance in our prosperity has been at least as great during the present year as it has been in 1922.

The TREASURER also read a few extracts from the Financial Statement, and both Report and Accounts were adopted unanimously on the motion of Dr. C. J. GAHAN seconded by Mr. W. RAIT-SMITH.

It was announced from the Chair that the Fellows nominated as Officers and Council for the ensuing year had been duly elected in accordance with the Bye-laws.

In the absence of the PRESIDENT, owing to illness, his Address
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was read by Dr. S. A. NEAVE. At its conclusion a vote of thanks to the PRESIDENT, coupled with the request that it might be printed in the Proceedings was moved by Mr. E. E. GREEN, seconded by Mr. G. T. BETHUNE-BAKER and carried unanimously.

A vote of thanks to the Officers for their services was then passed on the motion of Professor E. B. POULTON, seconded by Mr. F. D. MORICE, and Mr. W. G. SHELDON, Dr. S. A. NEAVE and Mr. H. J. TURNER briefly replied.

MEMORANDUM AS TO ASSETS AND LIABILITIES AT DECEMBER 31, 1922.

ASSETS.			LIABILITIES.		
	£	s. d.		£	s. d.
To Freshford Premises 41, Queen's Gate, S.W.			By Amounts Due from the Society—		
Cost of Purchase	6,250	0 0	Printing Transactions, Parts III, IV, and V	386	2 2
" Library, Furniture and Fittings	Not valued *		Sundry Accounts	148	12 6
" Present value of—			" Subscriptions received in Advance	544	14 8
21,364 2s. 27.13% Consols, Compound- ing Fund (Cost £1,253 8s.)	751	10 6	" 5% Debentures—	17	17 0
4413 1/2% 4% National War Bonds			Issued for Purchase of		
1883 3 1/2% 4% National War Bonds			41, Queen's Gate, S.W.:		
(Cost £340 10s.)	435	14 9	As at 1st January, 1922	4,640	0 0
£239 12s. 4d. Birmingham Corporation			Less Repaid during year	915	0 0
3% Stock, Westwood Bequest (Cost				3,725	0 0
£250)	155	14 9	Add Interest Accrued	46	11 3
" Amounts due to the Society—	1,346	0 0		8,771	11 3
Subscriptions	167	6 0	" Excess of Assets over Liabilities—		
Admission Fees	25	4 0	General Account	391	12 5
Publications	13	5 7	Compounding Fund	3,220	18 8
Rents and Contributions to House			Compounding Fund	1,272	13 1
Expenses	132	10 0	Library Fund	5	3 3
Sundries	11	5	Westwood Bequest Fund	155	14 9
Less not considered good	337	17 0	Repairs to Premises Fund	90	11 11
	30	0 0		5,136	14 1
Cash at Bank and in Hand—	317	17 0			
General Account:					
Overdrawn	50	0 0			
On Deposit	867	0 0			
In hands of Secretary	9	5 4			
In hands of Treasurer	2	2 0			
Less Current Account	878	7 4			
Overdrawn	195	9 0			
Housing Fund—Current Account	682	18 4			
Compounding Fund—Current Account	695	18 8			
Library Fund—Current Account	82	7 10			
Repairs to Premises Fund—Current	5	3 3			
Account	140	11 11			
	1,557	0 0			
	23,470	17 6			

HOUSING FUND (TOTAL RECEIPTS AND PAYMENTS TO DECEMBER 31, 1922).

RECEIPTS.		PAYMENTS.	
£	s. d.	£	s. d.
To Receipts to December 31, 1921	9,451 9 3	By Payments to December 31, 1921	9,107 9 8
" " in 1922	1,272 7 1	" " in 1922	920 8 0
	<u>10,723 16 4</u>	" Cash at Bank at date	995 18 8
	<u>£10,723 16 4</u>		<u>10,723 16 4</u>

HOUSING FUND (AMOUNTS RECEIVED IN 1922).

£	s. d.	£	s. d.
To Balance at Bank as per Last Account	343 19 7	By Repayment of Debentures	915 0 0
" Transfer from General Account	333 0 0	" Stationery and Printing	5 8 0
" Donations	939 7 1		<u>920 8 0</u>
	<u>1,272 7 1</u>	" Cash at Bank	695 18 8
	<u>£1,616 6 8</u>		<u>£1,616 6 8</u>

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WESTWOOD BEQUEST FUND.

£	s. d.	£	s. d.
To Balance at Bank, January 1, 1922	7 3 8	By Amount Paid on Account of Cost of Plates for	
" Interest on £238 12s. 4d. Birmingham 3% Stock	14 7 4	Parts III and IV of Transactions, 1922	14 7 4
	<u>14 7 4</u>		<u>14 7 4</u>

LIBRARY FUND (NEW BOOKS).

RECEIPTS.		PAYMENTS.	
	£ s. d.		£ s. d.
To Balance at Bank, January 1, 1922 57 18 10	By Expenditure on New Books 134 13 7
" One-half of Admission Fees received in 1922 81 18 0	" Balance at Bank at date 5 3 3
	<u>£139 16 10</u>		<u>£139 16 10</u>

COMPOUNDING FUND.

	£ s. d.		£ s. d.
To Balance at Bank, January 1, 1922 66 2 4	By Investment in £23 4s. 5% National War Bonds, 1926 65 12 6
" One-half of Admission Fees received in 1922 81 15 0	" Balance at Bank at date 82 7 10
	<u>£148 0 4</u>		<u>£148 0 4</u>

REPAIRS TO PREMISES FUND.

	£ s. d.		£ s. d.
From General Account for 1921 50 0 0	By Payments 29 8 1
" " " 1922 70 0 0	" Cash at Bank 90 11 11
	<u>£120 0 0</u>		<u>£120 0 0</u>

W. G. SHELDON, *Treasurer.*

We have audited the Treasurer's Accounts of Receipts and Payments and the Statement of Assets and Liabilities with the Books and Vouchers of the Society and find them to be correct. We have also audited the Accounts of Messrs. B. B. Keen & Co., Solicitors, of 41 Rother Street, W., and have certified to us that they hold the deeds of the property on behalf of the Trustees for the Debenture Holders. We have verified the other investments and Bank Balances.

(Signed) W. B. KEEN & Co., *Chartered Accountants.*

23, Queen Victoria Street, London, E.C. 4.
January 16, 1923.

THE PRESIDENT'S ADDRESS

LADIES AND GENTLEMEN,

The Reports of the Council to which we have been listening confirm our expectation that the new chapter in the history of the Society, inaugurated by the acquisition of premises of its own, would be the beginning of a period of increasing activity and prosperity. It is very satisfactory to hear from the Treasurer and Secretary of the sound state of our finances and of the large number of new Fellows who have joined the Society in the course of the year, and it is most gratifying that, in spite of the great cost of printing, we have been able to keep up the standard of our publications without undue strain on our resources. I need not comment further on the Reports presented to you, except that I should like to give renewed expression of our gratitude to all who have assisted the Society by donations, and in particular to the Misses Chapman for their generous gifts.

There is every year one point in the Council's Report which fills us with regret, the list of Fellows who have died in the course of the year. In 1922 death has again taken its heavy toll, and we have lost friends and fellow-workers whom we shall miss very much.

A. W. Bacot, the Entomologist of the Lister Institute, frequently exhibited at our meetings parasitic insects which he studied in connection with the transmission of diseases. His devotion to this humanitarian subject has cost him his life. While on a mission to Egypt in order to ascertain more fully the bionomics of the parasites which transmit typhus and kindred diseases, he contracted typhus and fell a victim to it. His contributions to his particular branch of applied Entomology are not only numerous, but in consequence of

the great pains he took in this delicate work, also of great value to medical Entomology.

H. Rowland-Brown, barrister, journalist, poet and entomologist, who died in May 1922, a few weeks short of 57, was a very familiar figure at the gatherings of Entomologists. He was best known to us as a very efficient secretary to our Society, devoting much time and energy to this office. When his final breakdown early in 1922 compelled him to give up his active connection with the Society, we lost in him a most genial companion and colleague. He was most interested in European butterflies, on which he has published a number of articles in various magazines.

With W. L. Distant, who died on February 4th, 1922, our foremost authority on Rhynchota has passed away. To the younger Entomologists who knew him as a famous Rhynchotist it generally comes somewhat as a surprise to learn that he was also the author of the splendid volume "*Rhopalocera Malayana*," a book still indispensable to everyone who is interested in Malayan butterflies. Lepidoptera were his early love, but he soon left them in order to devote himself mainly to Rhynchota. His contributions to the study of this order of insects are so extensive that it is impossible to give an adequate idea of them in a short notice. Foremost among his publications are the seven volumes on Heteroptera and Homoptera in the Fauna of British India, some volumes in the "*Biologia Centrali-Americana*," and the "*Insecta Transvaalensia*."

Hamilton H. Druce was only 54 when he died in June last. Many of us have profited by his knowledge of the *Lycanidae* and *Hesperiidae*, in which families he was a specialist. His publications referred almost exclusively to these families, of which he had a fine collection, now in Mr. J. J. Joicey's possession.

H. J. Elwes, president of this Society in 1893-4, took a wide interest in many branches of natural sciences, in botany no less than in zoology. Circumstances permitted him to follow his temperament and devote much time to travelling in foreign countries, where he employed to great advantage the opportunities he had in unexplored fields. His interest in

Entomology was almost restricted to Lepidoptera, of which he had an extensive collection. His works on *Parnassius*, *Erebia* and on Oriental Hesperidae are among the best known publications on these subjects. Some of his botanical works, such as the "Monograph of the Lilies" and "The Trees of Great Britain and Ireland," are magnificent productions.

G. A. Rothney, well known as a student of Hymenoptera, particularly of the Oriental fauna, died on January 31st at the age of 72. His valuable collection and books relating to the subject were presented by him to the Hope Department at Oxford.

Much useful work in the exploration of local faunae has been accomplished by our lamented colleagues W. M. Geldart, the Coleopterist, and Lachlan Gibb, A. Horne, A. Marshall, and R. H. Moore, whose contributions to the knowledge of British Lepidoptera are found in the *Entomologist* and other magazines.

From the colonies the news has reached us of the death of our Fellows R. M. Lightfoot, at the Cape of Good Hope, F. M. Littler, in Tasmania, G. Storey, in Cairo and J. Winter-scale, in Perak.

On August 27th passed away one of the most distinguished Coleopterists of our time, Dr. David Sharp, president of this Society in 1887-8, special Life Fellow since 1921, and corresponding and honorary member of many foreign societies. His works on various groups of British Coleoptera, on the Dytiscidae of the globe, on the beetles of New Zealand, Japan, and Central America, and especially the volumes on *Insects in the Cambridge Natural History series*, to mention only a few of his more important contributions to our science, are known and used all through the entomological world. He died at the ripe age of nearly 82, after a life full of devotion to the work he loved.

W. Purdey, who died on the 1st of February, was well known to most British Lepidopterists as a very successful collector of Microlepidoptera in the neighbourhood of Folkestone, where he lived. Many of us have corresponded with him and have in our collections specimens obtained by him.

The death is also announced of L. Bedel, of Paris, one of the best contemporary French Coleopterists, and of two very successful collectors of Lepidoptera in the tropics, H. Fruhstorfer, who died at Munich, and A. H. Fassl, who has been carried away by the vicissitudes of the climate of the Amazons.

I will now address you

ON SOME ASPECTS OF VARIATION IN LEPIDOPTERA.

Looking back in mind on the exhibits and discussions during the two years I have had the honour of occupying the presidential chair of the Entomological Society of London, I think I am right in saying that two subjects have claimed much of our attention and interest: (1) the dissimilarity among the individuals of Lepidoptera which constitute a species—or variation, and (2) the similarity obtaining between many different species—or mimetic resemblance. The two subjects are so closely interwoven that one cannot deal with the one without touching upon the other. We are all familiar with the fact that the variation of a species is a two-fold one: we observe on the one hand the differences between the individuals of a species within a faunistic district—or sympatric variation, and on the other hand the differences which are perceived if the whole range of the species is taken into account—or dyspatric variation. Although for you, who have studied variation in one group of insects or the other and have seen at the meetings the exhibits bearing on the subject, there will hardly be anything new in what I have to say on the variation of Lepidoptera, the two-fold aspect of variation is very little understood outside the circle of active systematists and field-biologists. While the publications on systematics consist to a large extent of the differentiation between the geographically separated races of species, in the works of philosophers explaining the world to us scarcely any notice is taken of this side of variation—or it is impatiently waved aside, as for instance by the famous philosopher Nietzsche, who, in a chapter against the Darwinian explanation of evolution, says about the modifications through the influence of food and climate that “they are in reality absolutely negligible.” You will agree with me, I know, that in these circumstances it is a duty of biologists to

counteract such one-sidedness by emphatically stating again and again that the variation of the species from district to district is the rule and not the exception, and it appears to me appropriate that a protest should be uttered from this place, because Entomology plays such an important part in the elucidation of the problems of life.

Every Entomologist with a little experience is aware that in any district where there is no physiographical barrier preventing a promiscuous interbreeding of the specimens of a species, the community of individuals may be practically uniform or may be variable, there being a gradation from uniformity as the lower extreme to polymorphism as the upper extreme. The diversity between the groups of individuals of polymorphic species is frequently so great, and the differences are often so sharply defined, that in many instances the varieties have been mistaken for species until their true status was discovered. The variation is either independent of sex, or is sexual or partly sexual. *Papilio clytia* from India with a striped and a brown form in both sexes may be taken as an example of non-sexual dimorphism; *Hypolimnas dubius wahlbergi* from South Africa is sharply dimorphic; and *Papilio lysithous* is trimorphic in Rio Grande do Sul and other parts of South-east Brazil. Sexual dimorphism goes often very far in Lepidoptera. The wingless females of Psychidae and some other Heterocera may be mentioned as one extreme development, but equally striking are the differences in the shape and colouring of the wings in numerous other Lepidoptera, of which some species of *Troides*, *Papilio*, *Planema* and *Argema* here shown may serve as examples. Very often each sex appears in one form only; in many instances, however, one sex or both are split up into two or more forms; this is frequently the case among Papilionidae and Nymphalidae (*Papilio memnon*, *P. polytes*, *P. rumanzovia*, *P. androgeus*, etc.; *Hypolimnas*, *Hestina*, *Charaxes*, etc.). Common as the phenomena of di- and polymorphism are in Lepidoptera the distribution of the different kinds of variation among the various families is by no means uniform, there being several points in its occurrence that appear to me of some interest. The strong reduction or loss of the wings occurs only among

Heterocera, being sporadically found among *Geometridae*, *Arctiidae*, *Lymantriidae*, *Lasiocampidae*, *Hepialidae*, and obtaining in all species of *Psychidae*, *Heterogynidae* and *Somabrachidae*; in Noctuids this line of development is fairly advanced in certain Alpine species, the females of which seek safety in crawling into the ground or the herbage like a Carabid beetle rather than trusting to the shortened wings, while in some other Noctuids the wings are quite reduced. As a rule the females of *Heterocera* are larger than the males, the difference frequently being so great that one would hardly believe in the specimens being the sexes of the same species, as for instance in some *Lasiocampidae* and *Saturniidae*. On the other hand, it happens also that the male is rather larger than the female and, moreover, has acquired a modified contour of the wings, as for instance in some species of the Saturnian genus *Oxytenis*, of which the males have been placed in one genus and the females in another far removed from the former. The differences in the colouring and pattern of the sexes are likewise often very striking in *Heterocera*. All this shows that the *Heterocera* have the faculty of acquiring a great sexual diversity. That being so, is it not remarkable that there is among night-flying moths no such clear-cut polymorphism as we so frequently observe among butterflies? I said night-flying moths, because there *is* sharply marked polymorphism also among *Heterocera*, for instance among *Arctiidae*, *Agaristidae*, and *Zygaenidae*, but—and this is an important point—the species in which this obtains are day-fliers like the butterflies. I mention as an illustration the Agaristid *Immetalia saturata*, a day-flying moth to which I shall refer again later on. Here sunshine and polymorphism are coincident, and does it not look as if sunshine was a condition for the development of polymorphism? But that is not all. In the majority of polymorphic day-fliers and in numerous sexually dimorphic species the pattern and colour are more or less the same as those of other species occurring along with them. The various forms of *Papilio lysilthous*, from S. E. Brazil, fly in the same localities as the various distinct species of *Aristolochia* *Papilios* which they resemble. The numerous forms of *Pseudacraea eurytus* are repetitions of the colouring and pattern

of a number of distinct species of *Planema*. The two forms of *Hypolimnas dubius* look like the two distinct species of *Amauris*, which are shown along with them on the slide. The females of the Chalcosiinae often bear a close resemblance to butterflies, while the males are quite different, for instance the female of *Cyclosia hecabe* might easily be mistaken for the Pierine *Terias hecabe*, and the female of *Cyclosia papilionaris* for a Danaine butterfly. Many other instances of such resemblances between sympatric species have been exhibited at our meetings. If we compare this kind of daylight di- and polymorphism with the kind of differences obtaining in night-flying Lepidoptera, in which evolution tends to produce a resemblance to dead leaves, lichens, twigs, pebbles, etc., the three-fold coincidence of (1) daylight, i. e. visibility, (2) sharply marked and conspicuous di- and polymorphism, and (3) resemblance to sympatric species, forms such a striking contrast that nobody can seriously maintain it to be due to pure accident. There must be some connection between the three concurrences; we require an explanation; we cannot look upon these facts as merely curious; and the explanation most satisfactory and which faces the facts squarely is that given by Natural Selection acting on the varieties produced by the influence of the physical conditions (in the widest sense) of the environment, however strong the modern and popular tendency may be to decry Natural Selection as a factor in Evolution.

We now come to the second kind of variation which no field-entomologist can have failed to observe who has ever collected in two different faunistic districts, such as Scotland and the South of England, or Central Europe and the Mediterranean countries. We have seen here exhibited many illustrations of geographical variation, with regards to tropical countries particularly from the collections of Mr. Joicey and Mr. Kaye. A collector passing from one district into the geographically nearest but faunistically different country, will meet with many familiar species which, however, to him as an expert have an unfamiliar appearance; they are the old friends, but with a difference. Let us take as an example the Lepidoptera of Great Britain and Ireland. We read in Wallace's "Distribution of Animals," in the chapter on the

British Islands, that "their animal productions are so uniformly identical with Continental specimens as to require no special mention," only "some few British species differing slightly from their continental allies." This opinion no longer holds good, a rather large proportion of the resident species of these islands being now known to differ in some way or another from Continental or at least Central-European specimens. That is not due to a change in the animals since Wallace's time, but to a difference in the method of working on the part of the systematist. As in everything, there are also two sides to systematics: similarity and dissimilarity. If one of the two sides is emphasised to the detriment of the other, a wrong picture is presented of the actual state of things, and those who rely for general conclusions on the work of the systematist are bound to arrive at an erroneous conception of nature. In Wallace's time the tendency was in the direction of appreciating the similarity of the specimens from different countries rather than the differences, which appeared superficial and unimportant. For the Ornithologists of that time a Robin from England, Germany or Madeira was a Robin; they were quite right inasmuch as these countries each have a Robin, but were wrong in implying that these Robins were identical. And that applies equally to a multitude of other species in all orders of animals. We now speak of Scotch forms of Lepidoptera, of British and Irish forms, and it is common knowledge among British Lepidopterists that in a number of instances the species are not identical even in different districts of England. The Oak-egger from the shingle beach of Sheerness is very different from the form found inland; the Ruby Tiger (*Phragmatobia fuliginosa*) from the mountains of Scotland is very distinct from more southern specimens; *Coenonympha dorus* from Scotland and Northern England are by no means alike; and *Melitaea artemis* from Kent, Cornwall and Ireland show considerable differences. The Irish *Satyrus semele* and *Spilosoma mendica* contrast strongly with British specimens; and the *Hepialus humuli* from the Shetlands in which the sexes are practically alike in markings, while in other countries the species is sexually dimorphic, is one of the well-known classical examples of geographical variation.

From the examples mentioned we must not draw the conclusion that local forms always exhibit some conspicuous distinction. On the contrary, a large proportion are but slightly different, or their differences are inconstant. Our knowledge of this side of the variation of British Lepidoptera is still far from being complete. It will require a great deal more collecting and patient study before we have a satisfactory survey of the variation of the Lepidoptera within the British Isles, and particularly before the differences between our insular fauna and that of the Continent can be clearly demonstrated in all its aspects. Here is a field for the younger Entomologists, and I should recommend the thorough study of a few species throughout the British Islands and, at least Western and Central Europe as a task well within the capacity of any enthusiast. The results of such research, for instance upon species like *Pieris napi* and some of the commoner Satyrinae, would be most valuable, especially if the distinctions observed were tested by experiments in breeding.

Among the Continental Lepidoptera the species of which the geographical variation has attracted most attention in recent years, is *Parnassius apollo*, which extends from the Sierra Nevada in the south of Spain over the mountainous countries of Central Europe southward to Sicily and eastward to Central Asia, reappearing in the north in the Baltic countries. The local races described of *P. apollo* are now almost innumerable. The species varies so much locally that every mountain stock and every isolated range has its own race, some easily distinguished, others overlapping in characters, and others evidently bearing a different name because they are from another valley. I will not multiply the illustrations of geographical variation in European Lepidoptera, many of you knowing as much about it as I do, or more, but will proceed to show some examples from the tropics.

As you know, the phenomenon of geographical variation was first clearly perceived and stated by Bates. The observations upon which this explorer based his opinion were made in the tropics, and scientists at home were long under the impression that this kind of modification of a species in different districts obtained in tropical countries rather than in the temperate

zone.* That was a misconception, but an excusable one. In the tropics there are so many more brightly coloured and large species than in the temperate countries, and the differences in large and gaily coloured specimens appear so much more pronounced for our eyes than those obtaining in small and sombre-coloured species that, with this reservation, the tropical species may be said to exhibit the various kinds of variation in a more intense form, but the geographical variation is just as regular a phenomenon in the temperate zones as in the tropics. The classical countries where Bates and Wallace made their discoveries are the Amazons and the Malay Archipelago. Considering the continuity of the Amazon basin from the Andes to the Atlantic, and the slight rise in height from sea-level at Pará to little over 300 ft. at the foot of the Andes, a distance of nearly 2000 miles, Bates must have been fairly startled by the modifications within the species collected by him at Pará on the Lower Amazons, Obidos and Manáos on the Middle Amazons, and Ega on the Upper Amazons. We take it now as a matter of course that we receive different species or different geographical races from these three Amazonian districts. After a fact of this kind has been clearly pointed out, it is easy to follow the lead and apply that knowledge also elsewhere. The geographical variation discovered by Bates on the Amazons we now know to obtain in a no less marked degree on both American continents in the direction from east to west as well as from north to south. A tropical species which has spread north and south into the temperate countries is usually represented by a different geographical race in the east of the U.S.A. and in the Western States, in East Mexico and in West Mexico, the eastern Mexican race extending as a rule south into Honduras and even Nicaragua, another race again in Costa Rica and Panama, West, Central, and East Colombia, and so on.

Experience has taught us that in Africa, south of the Sahara, the chief faunistic provinces as regards Lepidoptera are likewise well marked. Without going into detail I mention that the West African forest region has two major provinces, the one extending from Senegambia to the Niger, and the second from the Niger to the Congo basin; South Africa has generally

its own races, and the East African coast districts are faunistically different from Somaliland and Abyssinia as well as from the districts of the lakes in the interior. I show you as illustration of this division of African species into geographical varieties *Papilio menestheus* from Sierra Leone, the Congo and South Africa, and along with it *Charaxes brutus*, which varies in a similar way. These two species have been chosen because they illustrate another interesting phenomenon: Congolese varieties of many species are larger and have the markings reduced, the South and East African varieties have larger markings and usually have distinct submarginal spots on the hind-wing, while these spots are often missing or reduced in the West African forms. This by the way.

In the Indo-Australian countries geographical variation is equally pronounced. Ceylon, South India, North-west India, Sikkim and Bhutan, the Assamese Hills south of the Brahmaputra, Burma, Tenasserim, the Malay Peninsula and nearly all the islands or groups of islands of the Indian and Pacific oceans have each its special local races. For instance, *Papilio sarpedon*, extends from Ceylon to Japan and eastwards to the Solomon Islands; it is broken up into a multitude of geographical forms, some of which we show on the slide. I draw your attention to the seasonal difference in North Indian specimens, further to the dimorphism in the Chinese summer specimens, and to the large size and strongly falcate forewing of the specimens from the lowlands of Celebes and the Sula Islands; the slide, further, illustrates a variation I have as yet not mentioned, that is the difference frequently found in specimens from different altitudes. On Celebes as well as Ceram there exists a lowland race and a mountain race of *P. sarpedon*, very unlike each other, and undoubtedly derived from different sources, the lowland race of Celebes being of Moluccan origin and the mountain race of Malayan derivation, while in Ceram the one is truly a Moluccan race and the other has its affinitive in New Guinea. On the whole *P. sarpedon* has a limited individual variation, the specimens, apart from Central and West China, being practically uniform in each locality. The problem is much more complicated and also much more interesting and instructive in the case of

sympatrically polymorphic species. Earlier in this address I have mentioned the Agaristid *Lyneustis saturata* as a day-flying polymorphic species. This moth occurs in Southern New Guinea in three individual forms, both sexes being either white-banded on both wings, or white-banded on the fore-wing and orange-banded on the hind-wing, or orange-banded on both wings, a sharply marked trichromatism, a fourth form, with the band of the hind-wing replaced by a few white scales, being represented by a single female in my collection. In Northern New Guinea, at a low altitude, the ♂ is always white, but the ♀ is either white-banded like the ♂, or white-banded on the fore-wing and orange-banded on the hind-wing, or orange-banded on both wings. In Eastern New Guinea (in the district around the Huon Gulf), and on the islands off the north-east coast, both sexes are always orange-banded. On the Southern Moluccas—we have only a few specimens from Aru and Key, and do not know the extent of variation on these islands—the band of the hind-wing is always missing, at least in the lowlands, the band of the fore-wing being white in the Ceram ♂ and either white or orange in the Ceram ♀, white in both sexes on Amboina, and orange in both sexes on Buru. In the Northern Moluccas both wings have a band, which is always orange in both sexes. That is to say: a species tetramorphic in one district appears in another district monomorphic in the ♂, trimorphic in the ♀, in other places sexually dimorphic, or entirely monomorphic. A somewhat similar case is that of *Papilio clytia*. In India and Indo-China it occurs in two main forms, each individually variable, a streaked form and a brown one; in North India occasionally intermediates appear which are not known from any other district. In the Andamans occurs only a streaked race, on Palawan a monomorphic brown race or, if you like, species, and on Timor and neighbouring islands the species is represented by a streaked *Papilio*, the islands in between and Malacca being inhabited by the specifically distinct, though closely allied, *Papilio paradoxus*, the mimic of various Euploes. As a third example of polymorphism I mention *Papilio memnon*. In this species the ♀ is of particular interest, though the ♂ also varies geographically. The point to which I wish

to draw your attention is this: while in Java, Sumatra, the Malay Peninsula, India, etc., one of the several females is tailed, there is no tailed *memnon*-♀ on Borneo; the Bornean form which corresponds to the tailed one of Sumatra has preserved the pattern distinctive of the tailed ♀, but the tail has been lost entirely.

Now let us for a moment consider geographically separated varieties of Lepidoptera from quite a different point of view. Along the west coast of Sumatra there is a chain of islands each of which has its own, numerous, races of Lepidoptera, many of the races being markedly different from those found on Sumatra. On the other hand, the Natuna Islands between Borneo and the Malay Peninsula are farther from Borneo than, for instance, Nias is from Sumatra, yet their Lepidoptera do not exhibit such conspicuous modifications as do those of Engano, Mentawai, Nias, etc. What is the reason for this difference in the degree of variation? The insects in question being the same species, the cause of their greater modification on the one group of islands than on the other must be sought for in the nature of the islands, using the word nature in the widest sense, including the age of the islands. Entomologists know very well that a geographically old district separated by sea or low lands from the nearest geologically old district has its own geographical races. The modifications in the species may refer either to colour, size, shape, or structure, or to all, the species not reacting all in the same way. That is to say, geographical variation also depends on the nature of the insect. If we see it stated that a certain species has a very wide distribution, but does not exhibit any geographical variation, at once the explanation forms itself in our mind either that the species is carried frequently from place to place by the power of its wings or some other means, or that the species has not been carefully studied. And in most instances we find that nature has not made an exception, but that the systematist has made a mistake.

We have briefly considered first variation in one and the same locality and then variation in different localities, and now this question presents itself: are the varieties, whether local or geographical, all of the same value as regards evolution?

For instance, are a dark and a light form which occur together the same as a dark and a light form which are geographically separate? Staudinger and many other Lepidopterists have given an affirmative answer. In Staudinger's Catalogue of Palaearctic Lepidoptera many forms are designated as "var. et ab," i. e. they are considered to be individual aberrations in one place which have developed into geographical varieties in another. Looking superficially at collections it appears indeed to be so. But appearances are frequently misleading. The true bearing of a problem, whether in science, politics, economics or ethics, is more easily perceived, if the problem is pursued to its logical extreme. I will give some instances by way of illustration. The two specimens of the Geometrid *Triphosa dubitata*, both from Tring, differ in the one being paler than the other. If this difference became so normal in British *dubitata* that we had only dark specimens and pale specimens, development progressing in the same direction would result in well-marked dimorphism and no more; the dark form and the pale one would contrast strongly, but would nevertheless still form an interbreeding community. Compare now a Chinese specimen with the European ones. The Chinese examples are so similar to them that they have not received a name; they are, however, characterised by some slight structural difference in the genitalia. The geographical separation is here accompanied by a structural separation. What would be the result if this line of development was carried on? The other Lepidoptera on the slide will give the answer. They are both from the Oriental Region and taken quite at random from my collection, being selected for no other reason but the wide distribution assigned to them and, as we thought, the absence of any conspicuous geographical distinctions. As it happens, the outward appearance has proved deceptive. The Geometrid *Nobilis turbata* is said to occur from India to New Guinea; the three specimens figured show some very slight differences, but these are so fluctuating in a series that all the specimens stand in collections under one name. An examination of the structure, however, proves that there are an Indian, a Malayan and a Papuan form, so different that interbreeding would be difficult. The

other insect is a Noctuid, *Oxyodes scrobiculata*, a very common species throughout the Oriental Region, a distribution from Ceylon to New Caledonia being assigned to this moth. The differences in colouring are slight and so unstable that nobody seems to have suspected this *O. scrobiculata* to be composed of a number of forms. A study of the structure upsets the notion of uniformity altogether. What we call *O. scrobiculata* comprises the following forms: (1) the first figure represents a Ceylonese specimen; all Ceylonese and South Indian examples are sharply defined by the structure of the tail-ends, and this form extends into North India, where it occurs together with the next one, the differences being such that interbreeding would be interfered with; (2) from North India over Indo-China to Sumatra and Borneo a second form is found; (3) from Palawan and Java to Timor and New Caledonia occurs a somewhat brighter yellow insect with widely different tail-ends, and (4) in Queensland we find again a form structurally similar to the Indo-Malayan one, but different in some detail. There can be no doubt that both in the Geometrid *Nobilis* and the Noctuid *Oxyodes* the various forms are modifications derived from the same original stock. Their distribution proves that each form attained its high degree of diversity in an area geographically separate from the countries inhabited by the sister forms. That is to say, geographical segregation has here led to structural segregation and finally to such great diversity that the resulting varieties are as distinct as species. This conclusion based mainly on the morphology of the insects is corroborated by other observations on geographical varieties. It was Standfuss, I think, who first noticed that varieties from the same or similar locality were much easier to cross than geographically separate varieties, the aversion existing between species being already present to some extent in geographical varieties. Moreover, the fertility of such crosses was found to be impaired, and the offspring to be intermediate between the parents, as in the case of crosses between species. Further, according to observations on the fertilisation of the egg-cell and the subsequent fate of the ♂ and ♀ nuclei, the number of particles into which the nucleus of the fertilised egg breaks up in the process known as

karyokinesis varies but slightly within each species, no matter whether the sympatric specimens crossed are externally similar or dissimilar, and differs from the number observed in allied species. If, however, two species are crossed, the number of particles is very much lower, while an intermediate number results in the case of the crossing of two geographical races of a species. That is a most interesting confirmation of the conclusion drawn from the morphology of the imagines that geographical races are of a different standing in evolution than individual varieties.

However, in practice it is not always easy to decide whether a variety is really geographical. We have seen here exhibited more than once a certain class of variety which appears in years with an abnormal season. An excessive and prolonged rainfall or continued drought has a marked influence on the size and colouring of the Lepidoptera. Such wet or dry forms would disappear with the return of the climate to normal conditions. The material in our collections from tropical countries is frequently collected in one season only, or even in a few weeks, and in such circumstances we may easily take the product of an abnormal spell of weather for a geographical variety. The documentation in our collections unfortunately is limited, and therefore the work based on them remains always open to correction.

I thank you for the attention with which you have listened to this Address. Before leaving the Chair I should like to give expression to my gratitude to the Officers and Council for their untiring assistance extended to me during my term of office, and to the Society for having honoured me by the election as its President. The two years were full of interesting experience, and they will always remain as a very pleasant memory.

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ERRATA.

TRANSACTIONS.

- Page 196, after line 30 insert VENEZUELA.
Page 268, Fig. 1, etc., for *hircea* read *hircea*.
Page 268, Fig. 1, etc., for Butl. read Hew.
Page 303, line 22, for Jamieson read Jameson.
Page 339, line 26, and page 350, line 26, for Tongido read Longido.
Page 351, line 30, for Kbwezi read Kibwezi.
Page 356, line 34, for Wyangori read Nyangori.

